ELECTRICAL REVIEW

8 JU[illegible] 1955 PRICE 1s 6d

UNIVERSITY OF MICHIGAN
AUG
ENGINEERING

FERRANTI

SWITCHBOARD INSTRUMENTS

List IN30 and other catalogues supplied on request.

Illustrated above are several Ferranti Switchboard Instruments from a wide range. Shallow pressed steel cases 3¼", 3½", 4", 6" and 8" round or square dial. Projecting or flush mounting. All types of Ferranti switchboard instruments are also available in hermetically sealed cases.

FERRANTI LTD · MOSTON · MANCHESTER 10
Head Office and Works: HOLLINWOOD · LANCS
London Office: KERN HOUSE, 36 KINGSWAY, W.C.2

STEEL SHEETS

COLD-REDUCED, HOT-ROLLED

Black or Galvanized, also plates up to $\frac{1}{4}$ in. inclusive

SHEARED TO YOUR SIZES

QUICK DELIVERY

SPENCER

H. F. SPENCER & CO. LTD., MITRE WORKS, EAGLE STREET, WOLVERHAMPTON
Telephone: Wolverhampton 22266/7/8/9 Telegrams: 'Spencerian'

MAY WE SEND YOU OUR ST
If you would like to have it
id-diy drop a card to our
FOUR BRANCH
AT YOUR SERVI
WOLVERHAMPTON
Royton: Stadium Works, Do
Royton, Nr. Oldham, L
Telephone: Oldham Main 4204
Bristol: 27, Temple
Bristol
Telephone : Bristol 28
London: Talbot Road, We
London, W.13
Telephone: Ealing 967

Managing
General
Technical

In

VOLUM
Eighty-T
FRIDA

Editorial,
Code : AB
New Yor
Orders (

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E.
General Editor: J. H. COSENS
Technical Editor: P. W. TUCKER, M.I.E.E.

8 JULY 1955

In This Issue

51 THE INSTRUMENT INDUSTRY
53 INDUSTRIAL INSTRUMENTATION
60 WORLD ELECTRICAL MARKETS—CENTRAL AFRICA
62 WATER POLLUTION
63 LETTERS TO THE EDITOR
65 VIEWS ON THE NEWS
66 PERSONAL AND SOCIAL
69 PARLIAMENTARY REPORT
71 BRITISH ELECTRICAL POWER CONVENTION
81 SWITCHGEAR DEVELOPMENTS
82 RESTRICTIVE TRADE AGREEMENTS
83 REMOTE SUPERVISORY CONTROL
85 NEW ELECTRICAL EQUIPMENT
86 CATHODE-RAY TUBE MANUFACTURE
87 LOSS ON TRANSPORT SERVICES
88 FUEL RESEARCH
89 INDUSTRIAL NEWS
92 FINANCIAL SECTION
96 GENERATION AND DEVELOPMENT
97 CONTRACT INFORMATION

VOLUME 157 ◇ NUMBER 2

Eighty-Third Year of Publication

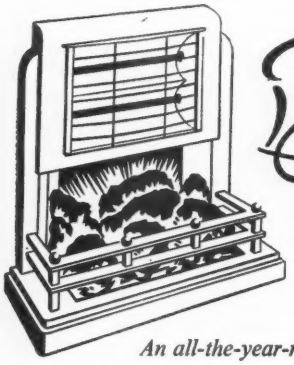
FRIDAY ◇ PRICE 1s 6d

103 CLASSIFIED ADVERTISEMENTS
116 INDEX TO ADVERTISERS

Editorial, Advertising and Publishing Offices: Dorset House, Stamford Street, London, S.E.1. Telegraphic Address: "Elecrev, Sedist, London." Code: ABC. Telephone No. Waterloo 3333 (60 lines). Registered at the General Post Office as a Newspaper. Entered as Second Class Matter at the New York, U.S.A., Post Office. Annual Subscription: Home and Overseas £4 10s 0d: U.S.A. and Canada $14.00. Cheques and Postal Orders (on Chief Office, London) payable to ELECTRICAL REVIEW PUBLICATIONS LTD., and crossed "Lloyds Bank."

Midsummer Magicoal

Heatwaves apart, there's no off-season for Magicoal fires. Always ready to cheer up dull summer days. Comforting companions on light but chilly evenings. Whenever you hear 'It's cold enough for a fire', it's a chance to keep up your midsummer Magicoal sales!



Berry's

MAGICOAL FIRES

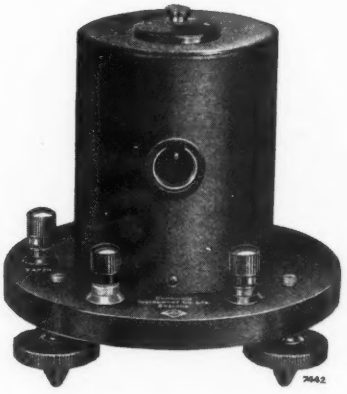
An all-the-year-round investment

Berry's Electric Limited Touchbutton House Newman Street London W1

Cambridge Flik GALVANOMETER

This robust and sensitive Cambridge galvanometer has the exceptionally quick period of one-tenth of a second for the standard instruments with the performance given in the table. Instruments can be supplied with even shorter periods at a slight sacrifice of sensitivity.

BRITISH INSTRUMENT INDUSTRIES EXHIBITION
EARLS COURT LONDON
June 28 - July 9 1955



Coil Res. (ohms)	Periodic Time (secs.)	Sensitivity mm./μA. at 1 metre	Ext. Res. for Critical Damping (ohms)
300	0·1	100	4000
20	0·1	20	100

Details are given in **SHEET No. 288-X** May we send a copy ?

CAMBRIDGE INSTRUMENT COMPANY LIMITED
13 GROSVENOR PLACE LONDON S.W.1

ELECTRICAL REVIEW

8 July 1955 Vol. 157 No. 2 Established 1872

The Instrument Industry

DURING the last war the British instrument industry had to produce and develop a wide diversity of equipment often on a mass production basis and to limits of accuracy which had hitherto been thought commercially impracticable. This did a great deal of good all round and to-day British instruments are recognized all over the world as being among the finest that money can buy; in fact many types of instruments can only be obtained from British manufacturers, which gives a good indication of the status of the industry.

In the review of the British Instrument Industries Exhibition which is published in this issue, a good cross section of the industry's products is described. It soon becomes obvious to the visitor that the day has long passed when an instrument was merely a device for indicating some quantity or other. The modern instrument can be something far more complex, not only measuring a quantity but also controlling it within very fine limits of accuracy. The exhibits at Earls Court cater for all types of industry, research and medicine and cover the measurement and control of pressure, temperature, flow, etc., to suit the widest diversity of requirements. Without some of the equipments on view, many industries would be hard put to it to operate their plants at a very high efficiency, for manual methods cannot compete with the automatic control scheme.

A large number of automatic control schemes and equipments have already been developed and are in use in industry and it has become quite clear that by using these methods productivity can be increased by an amount not possible in any other way. At the same time this " automation " as it is called, brings increased production, better quality products, lower overheads, better working conditions, and facilities for more efficient laboratory research. It should not for one moment be thought that automation savours of " gadgetry "—far from it. If industry generally takes advantage of the equipment which has been developed and is in course of development and exploits it to the full, it will no doubt have a great bearing on the general standard of living in this country.

RESTRICTIVE PRACTICES

Although it seems to have some doubts (and three or four members are positively against the rest) the Monopolies and Restrictive Practices Commission has reached the general conclusion that " exclusive dealing, collective boycotts, aggregated rebates and other discriminatory trade practices " all restrict competition in some degree. The reason given is that they " involve collective obligations which in some way limit the freedom of the parties in the conduct of their businesses." It is therefore recommended, with the above-noted dissension, that all the practices referred to should be prohibited by law. The Commission thinks, however, that any legislation should provide for exceptions to be made in certain circumstances in the validity of which the Board of Trade would presumably be judge. An alternative considered by the Commission but rejected by the majority was that all agreements of the kind should be registered with an " appropriate authority " and open to public inspection. The responsible Minister would refer any agreements appearing to be against the public interest and they would be prohibited if this was decided to be the case. It seems to us (as to the dissentient minority) that the latter method is preferable, and most certainly more justifiable, than the sweeping away of the whole means of maintaining some kind of order in an industry. As we have insisted before, industrial and commercial anarchy is unlikely to benefit the public in the long run.

ENGINEER-ADMINISTRATORS

Echoes of the long-standing controversy about the place of engineers in administration were heard at Brighton. They arose from the statement in Sir Henry Self's paper that it was necessary to recognize the fact that the bulk of the managerial appointments in the electricity supply industry called for engineering qualifications in addition to managerial ability. Thus the engineering technical staffs should be given the fullest opportunity for qualifying themselves for management. The fact that Sir Henry, although a man of many qualifications, is not an engineer lent peculiar force to his dictum and evoked a reaction from Mr. L. G. Moser, who represents the non-technical or what is often called the " administrative " side of the industry. It was, of course, welcomed by Mr. A. M. F. Palmer, who is (or was) a power engineer. The question was raised whether it was easier (a) for an engineer to acquire administrative wisdom or (b) for the non-engineer to gain sufficient technical knowledge. The answer is almost certainly that (a) has it but, in fact, the question itself is of secondary importance. As Mr. S. E. Goodall implied, the prime consideration is which man, engineer or otherwise, has the administrative quality in him which training will bring out and experience will test.

DELAYED POWER

Somebody asked the panel at the " Electrical Forum " at Brighton what was the principal " bottleneck " in power station construction. The answers showed that there were two: the prolongation of site work and civil engineering, and the protracted " consent " procedure. The first is a reflection of the general shortage of man-power which has limited the number of men employed by constructional firms. Mr. Eccles said that possible remedies were simplification and greater economy of labour. Delay in obtaining consents adds two years or more to the period between decision and completion. It can be reduced only by short-circuiting planning authorities, which would be considered anti-social, but greater efforts should be made to speed up procedure. Mr. J. R. Beard rightly pointed out that the scarcity of sites presented an increasing difficulty. Col. B. H. Leeson mentioned as a further handicap the growing problem of getting the large modern machines to their sites.

BOARDS AND " ELECTRICS "

Little enthusiasm for the battery vehicle was shown by the panel at the " Electrical Forum " at the Brighton Power Convention. They dwelt on its limited range and capacity and emphasized the low output-weight ratio of the storage battery. All these limitations have been realized for years and yet the electric vehicle has continued to make headway in the fields for which, in spite of these limitations, it is suitable. At the end of last year there were 30,548 in use, about a third of them being pedestrian-controlled vehicles. The question put to the panel was whether Electricity Boards should not use and encourage the use of battery vehicles. The general answer seemed to be negative but if the Boards do not consider the vehicles suitable for their own purposes (which is still a debatable question) they ought to encourage their use by others by providing charging arrangements and instituting promotional tariffs, if they have not already done so.

MAKING THE RAILWAYS PAY

When the British Transport Commission introduced its £1,200 million modernization and re-equipment proposals last January it emphasized that this large-scale plan was essential if the railways were to be made to pay their way. By taking advantage of technical developments, particularly in the fields of electric and diesel traction, it hoped both to improve revenues and cut down costs. The need for this is clear from the Commission's latest report, which discloses a net loss in 1954 of nearly £12 million, with the prospect of a further substantial deficiency this year. A warning is given that there will be an initial period during which the new capital expenditure will not improve the financial results and that " a condition precedent to undertaking a bold and far-reaching plan of new equipment, designed to give the country a railway system second to none, is that the enterprise must not be allowed to get into a position of irredeemable unbalance meantime." One of the ways in which economy is being sought is the closing of unremunerative branch lines. Many of these have lost traffic to the roads only because of the infrequent services provided. It has been suggested that as an alternative diesel or battery railcars should be operated. The latter are being used with success in Germany but the Scottish Area Board, after investigation, has said it does not, at present, feel justified in proceeding with such an experiment.

INDUSTRIAL INSTRUMENTATION

Third British Instrument Industries Exhibition

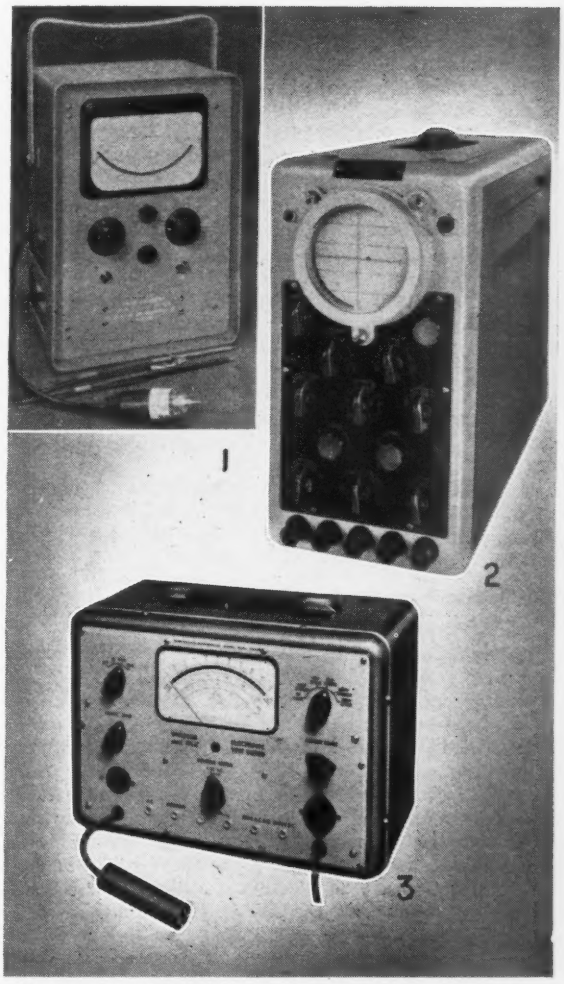
MORE than 150 of this country's leading instrument manufacturers are exhibiting and demonstrating their products at the third British Instrument Industries Exhibition now being held at Earls Court, London (28th June to 9th July). In view of the success of the first two exhibitions in this series the show is now well established as a biennial occasion. It is doubtful whether there is any other commercial exhibition in the world of an equivalent size and scope specializing in instruments and instrumentation and already many buyers from all parts of the world have visited the display.

The equipment and apparatus on view covers almost every conceivable field of instrumentation in industry, medicine, research and education. To put it briefly, there are diverse classes of temperature, pressure and flow controllers for industrial use, electrical measuring and controlling systems, complete equipment for sea and air navigation and land surveying, scientific instruments and equipment for all types of laboratories, electronic instruments for all applications and precision equipment for use in such diverse fields as metrology, photography and engineering design. No attempt has been made to arrange a " theme " for the display but it does emphasize the fact that production can be considerably increased and quality greatly improved by the use of appropriate instrumentation and control.

Many instruments developed for specialized research can often be used in other branches of research and also in industry. The various establishments of the Ministry of Supply are showing a number of items which might come under this category. For example there is a miniature pressure transducer designed to measure water pressure in testing parachute drops of airborne lifeboats. Other items include a new moving magnet electrical indicating instrument for use as a remote position indicator, a recording torque meter for use on radio component test work, a capacitance comparator which shows by direct meter reading the percentage difference in capacitance between an unknown capacitor and a known standard, and a barium titanite accelerometer.

Electronic equipment is becoming increasingly popular in all branches of science and industry and a representative selection of such items is shown by Cinema-Television, Ltd. Here there is an automatic unit providing a constant nominal 230 V a.c. output for any input voltage in the range 170 V to 270 V r.m.s. The accuracy of regulation is ± 1 per cent, the correction rate being 6 V/sec and the output 15 A at 230 V. Another interesting piece of electronic apparatus, shown by Taylor Electrical Instruments, Ltd., is an accurate valve voltmeter having the well-known characteristic advantages of a wide frequency range and high input impedance. It is adapted to cover a wide range of resistance measurement and can also be used as a direct reading output meter, scaled in decibels.

The latest addition to the voltage measuring equipment made by Marconi Instruments, Ltd., is the type T.F.1041 valve voltmeter which measures up to 300 V and 700 Mc/s



(1) Marconi type T.F.1041 valve voltmeter. (2) Cossor single beam oscillograph. (3) Taylor valve voltmeter

unbalanced in six ranges, and d.c. up to 1,000 V balanced or unbalanced in seven ranges. There are seven other ranges for the measurement of resistance between 0·2 Ω and 500 MΩ. Among the exhibits of 20th Century Electronics, Ltd., is a range of precision single and multi-gun cathode ray tubes with ground and polished flat faces, for use in accurate measurement and radar applications. Included in the range are 6in and 3½in diameter tubes with post reflection acceleration for high writing speeds.

Apart from its type WM1 inexpensive measuring oscilloscope, E.M.I. Electronics, Ltd., has a lightweight precision oscilloscope with facilities for instantaneous time and voltage measurement, dynamic balancing machines, strobo-

scopes, and a sub-miniature relay only 0·64in square by 0·74in. The electronic test instruments shown by Mullard, Ltd., include a wide band oscilloscope, a duel trace oscilloscope, and valve voltmeters of the diode plus d.c. amplifier type and the a.c. amplifier and rectifier type. Another new equipment is a stabilized power supply for providing h.t. and l.t. for electronic instruments. A particle counter and sizer, which analyses photomicrographs of powder samples, is shown in operation. Three new oscillographs, a double beam wide band, and two single beam instruments are shown by A. C. Cossor, Ltd., together with a frequency modulation receiver alignment generator. All three of the oscilloscopes have 4in diameter tubes which make them very compact and convenient to handle. The double beam model operates over the band width 10 c/s to 10 Mc/s while one of the single beam units incorporates a very wide band amplifier for the display and recording of fast transients. The other oscillograph is designed for observation and photographic recording of phenomena from zero frequency to 6 Mc/s.

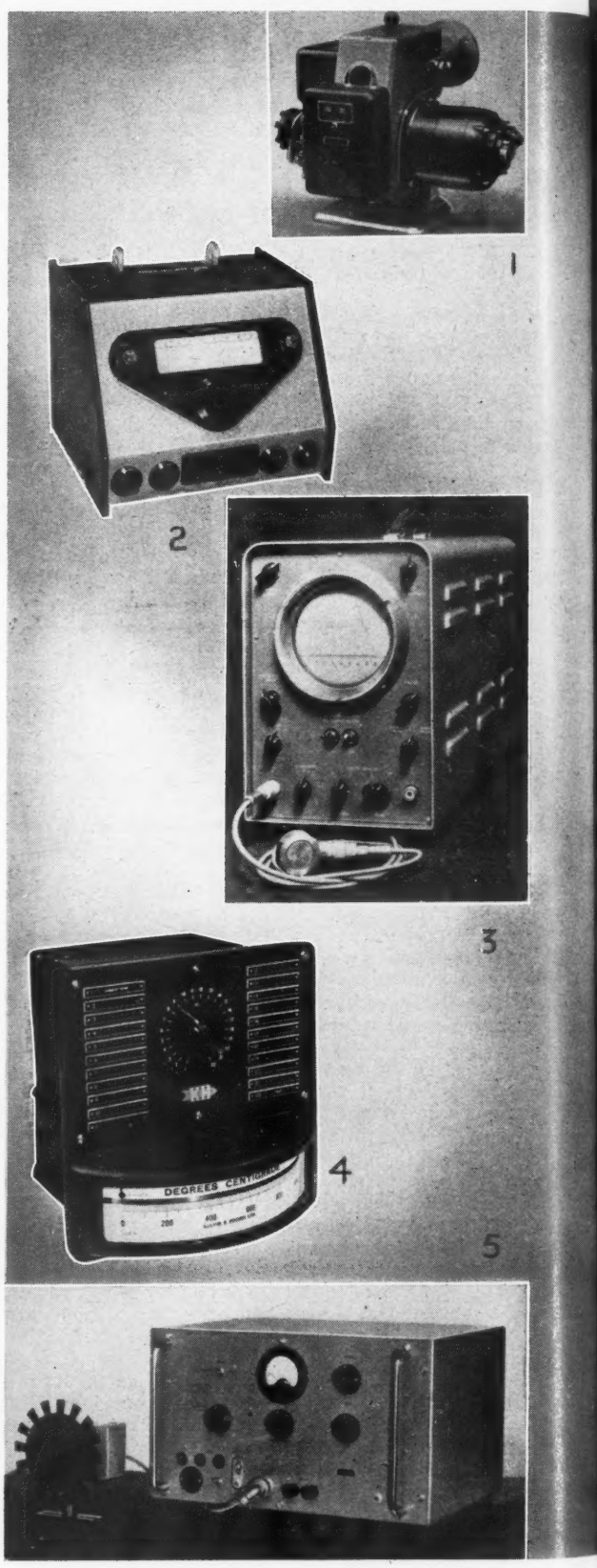
Among the wide range of electronic instruments shown by Dawe Instruments, Ltd., is a new sound level indicator type 1408B. It is compact and fits easily into any pocket, complete with dry batteries and is ideal for spot checks, industrial noise surveys, and for testing domestic and industrial equipment against an acceptance noise level. Apart from various multi-range indicating instruments British Physical Laboratories, Ltd., are demonstrating a direct-reading pulse height valve voltmeter. It is suitable for measuring repetitive pulses, both positive and negative. The reading is independent of pulse width from 10 milli-microseconds upwards, as well as from repetition rate above 700 pulses/sec. Among the new items shown by Measuring Instruments (Pullin), Ltd., is a multi-range test set, a 20-way switch, an e.h.t. probe-meter, cross-pointer plating control indicators and hermetically sealed instruments.

Ultrasonic Flaw Detection

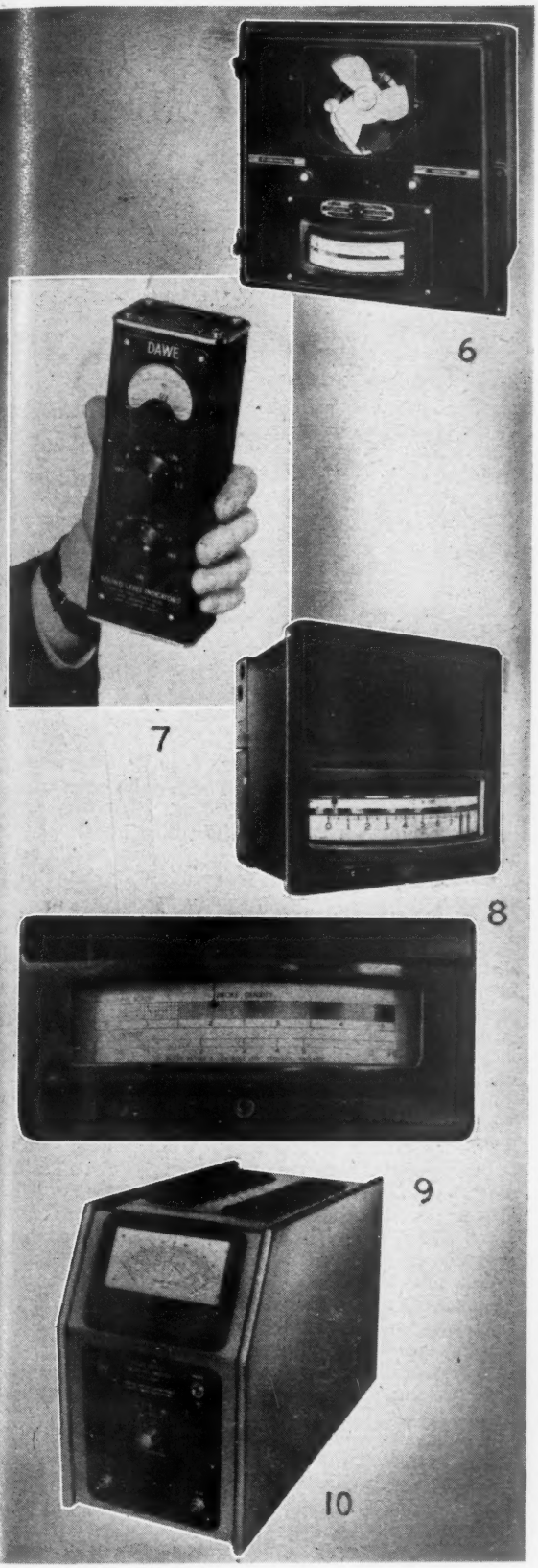
The ultrasonic flaw detection equipment shown by the Ultrasonoscope Co. (London), Ltd., was developed under the auspices of the Ministry of Supply and has recently become available for commercial use. Provision is made for operation at four switched frequencies from 0·5 to 10 Mc/s and either single or double probe techniques may be employed. The time base is linear and continuously variable to correspond to distances from 2in to 20ft in steel or aluminium, the minimum range being $\frac{1}{8}$in. Barium titanite transducers are used. In a different field J. Lyons & Co., Ltd., the caterers, are showing the "Kappa" moisture meter made by Toplis, Simpson & Co., Ltd., which covers moisture ranges from 0·5 per cent to upwards of 60 per cent. The instrument takes a sample of the material to be tested which is large enough to provide an overall average reading really representative of the bulk.

A diversity of photo-electric apparatus is demonstrated by Radiovisor Parent, Ltd., while a high gain amplifier for use with light-sensitive cells is shown by Mervyn Instruments. This amplifier has an overall gain exceeding 120 db and its input is suitable for both photo-voltaic and photo-conductive cells. It will thus be of interest to all who are concerned with the measurement of radiations from ultra-violet to the infra-red using these types of detectors.

In the field of industrial control the fifty-point print-out scanner known as "Frances," shown by Fielden Electronics, Ltd., provides a good solution to the problem



(1) Cass & Phillip electronic control panel mounted on a gun type oil burner. (2) "Kappa" moisture meter. (3) Ultrasonoscope ultrasonic flaw detection equipment. (4) Kelvin & Hughes multi-point temperature indicator. (5) Mervyn spectrometer amplifier



(6) Ether-Wheelco " Chronotrol " electronic temperature controller. (7) Dawe type 1408B sound level indicator. (8) Electroflo series 156B electronic indicating controller. (9) Bailey smoke density indicator. (10) British Physical Laboratories pulse height valve voltmeter

of automatic plant supervision. The equipment consists essentially of a d.c. potentiometer and a stepping switch which examines fifty variables in turn. There are also fifty set points which can be adjusted individually to the set values required for each variable. Thus, the d.c. potentiometer is used to examine the difference between the variable and the set point and no action is taken as long as the voltages are equal.

On the stand of Electronic Instruments, Ltd., is a demonstration of the automatic and continuous testing of the thickness of cigarette filling by means of the nucleonic weight controller. This equipment uses a vibrating condenser unit in place of the usual electrometer input valve. An elapsed time indicator and accessories, a rate meter, electronic oil burner units for both single- and three-phase operation, process timers and escapement mechanisms are shown by Cass & Phillip, Ltd.

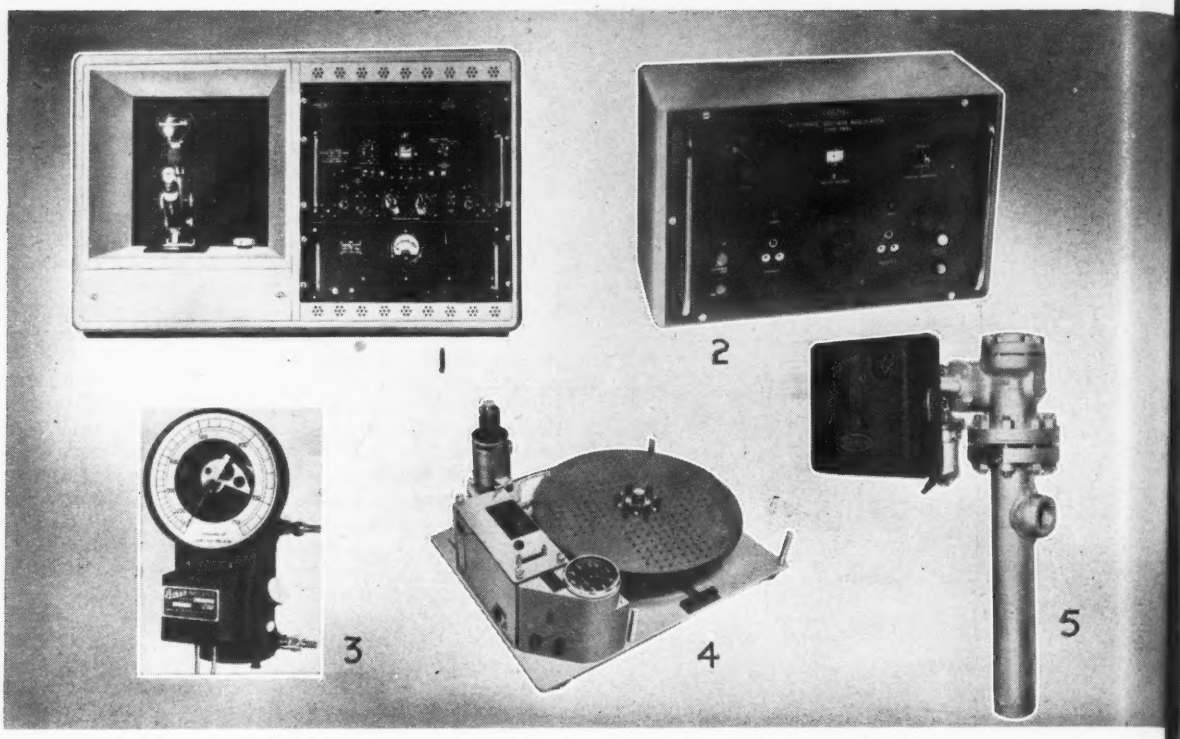
Process Control

Apart from valves and cathode ray tubes, portable recording equipment and gamma radiation survey apparatus the Edison Swan Electric Co., Ltd., has an electronic process controller for use in automatic production plant. It is suitable for any type of machine which has controls that can be electrically or pneumatically operated. The process and cyclic timers shown by Elcontrol, Ltd., are available in a limited number of basic forms so arranged to provide a very wide choice of timing ranges with a maximum of 300 sec. This company also has liquid level control equipment, flame failure and ignition programming equipment, photo-electric apparatus, and proximity switches.

The complete range of " Nullmatic " industrial process instruments is being exhibited by Sunvic Controls, Ltd. There is a plug-in controller, a new miniature pressure regulator, a leak detector, an industrial batch counter and a pulse height analyser. On the stand of Evershed & Vignoles, Ltd., may be seen a full range of industrial instrumentation equipment for the measurement and control of temperature, flow and pressure (of air, gas, steam and liquids), and liquid levels. One of the main exhibits is a control desk incorporating a form of instrument presentation known as the " in-line " scanner. It consists of shadow type indicators arranged close together so that the pointer shadows form a continuous line.

A comprehensive display of industrial measuring and controlling instruments is shown by George Kent, Ltd., the industries covered by the exhibits embracing gas, glass, steel, water, sewage, sugar, oil, and steam power. The exhibits of Elliott Bros. (London), Ltd., range from the simplest process control instruments to the latest type of electronic digital computer. The latter, which occupies a prominent place on the stand, is actively engaged in the solution of commercial and industrial problems similar to those undertaken by the Elliott Computing Service.

Apart from air-operated and oil-operated regulators Electroflo Meters Co., Ltd., is showing its series 156B electronic indicating controller, which is one of a wide range of electronic instruments combining indicating or recording with automatic control. This instrument is used for the control of many process variables, including temperature, level, pH, etc. Allied instruments and control systems are shown, some of them in operation, by Foxboro-Yoxall, Ltd., while Kelvin & Hughes (Industrial), Ltd., show a boiler control panel with a full complement of



(1) Baker blood-cell counting machine. (2) Airmec 750 VA automatic voltage regulator. (3) "Arkon" transmitting instrument. (4) Graseby centrifuge for precision testing of components under acceleration. (5) Mason-Neilan liquid level controller

instruments including a multi-point temperature indicator with a range of 0 to 1,000 deg F, and a number of electronic control equipments.

Electrical and electronic instruments for recording, controlling and indicating temperature are shown by Ether, Ltd., including the Ether-Wheelco "Chronotrol" programme controller for use where pre-determined heating and cooling cycles are required. Other recorders and controllers are shown by such firms as Honeywell-Brown, Ltd., the Foster Instrument Co., Ltd., K.D.G. Instruments, Ltd., and James Gordon & Co., Ltd. Bailey Meters & Controls, Ltd., is showing its smoke density equipment and a console control desk with miniature instruments for flow, pressure, temperature, draught, etc., and associated miniature control units for use on large unit boiler-turbine power plants enabling the operator to control plants up to 200 MW from a central point.

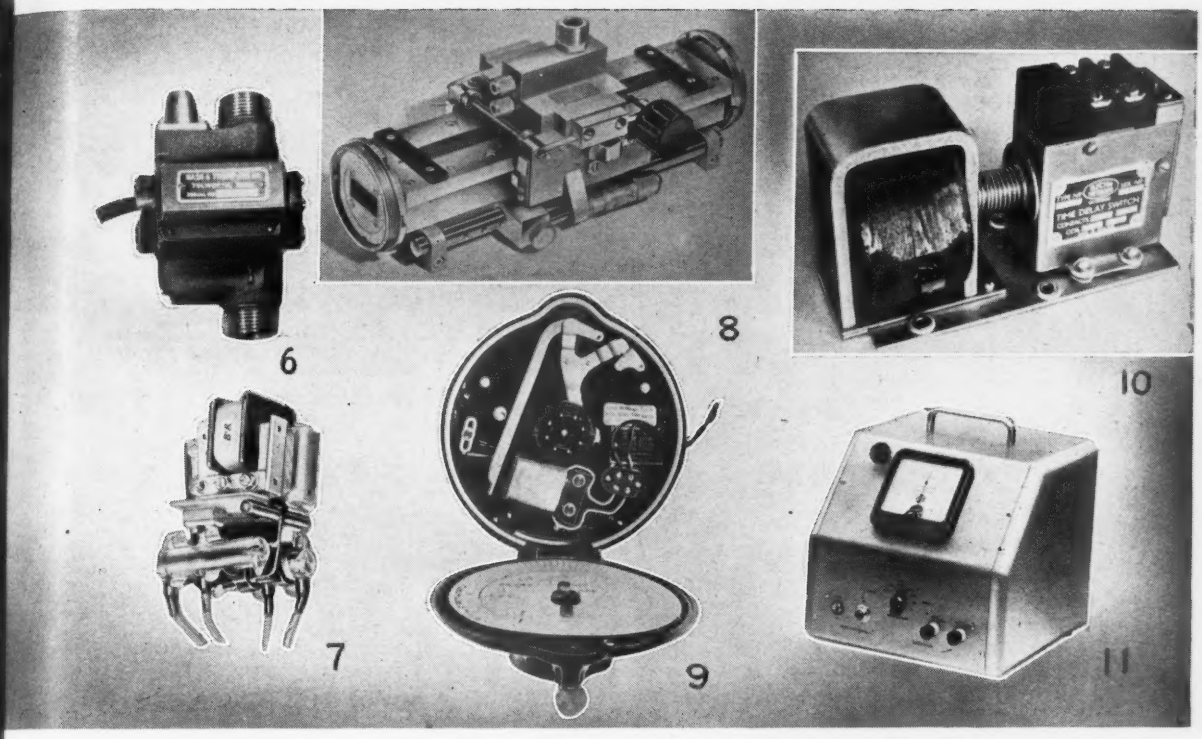
The electric recorder shown by Servis Recorders, Ltd., records the running and idle times of any machine, of any size, in which a simple 6 V or 12 V make-and-break mechanism can be incorporated. The temperature control unit type N856 shown by Airmec, Ltd., has a range of 96 deg C to 428 deg C and is designed for use in conjunction with platens, ovens, rooms, etc. This firm also has on view a flash tester with a continuously variable output voltage of 0 to 100 kV a.c. and 0 to 120 kV d.c., and a 750 VA automatic voltage regulator which maintains the output within ± 1 per cent of any pre-set value between 195 V and 260 V.

One of the main features of the stand of the General Electric Co., Ltd., is an electromagnetic transducer system developed by Salford Electrical Instruments, Ltd., for the remote indication of pressures and mechanical displacements. It enables mechanical displacements of less than 0·001in to be measured directly and can be adapted for measuring pressures from a few inches water gauge to over 200 lb/sq in. When used with a Bourdon tube it will measure pressures up to 10,000 lb/sq in. Other exhibits include hermetically sealed indicating instruments, portable, laboratory and educational instruments, a range of precision potentiometers, frequency measuring equipment and various panel mounting meters.

Linear accelerometers, accelerometer recorders, yaw meters, time delay switches, gyro calibration tables and other highly specialized items are shown by Graseby Instruments, Ltd., while W. H. Sanders (Electronics), Ltd., have on view an electronic welding controller together with microwave measuring instruments and components.

The Arkon method of tele-recording demonstrated by Walker, Crossweller & Co., Ltd., transmits any reading (for example, rate of flow) over any distance and provides chart reading, continuous indication and integration. It is a flexible system and allows several independent readings to be transmitted over one pair of wires. In an allied field the Crosby Valve & Engineering Co., Ltd., has a new displacement type air-operated liquid level controller and valve. This Mason-Neilan instrument is demonstrated to show the effect of variation of flow and level on the controller. An interesting item shown by the Mine Safety Appliances Co., Ltd., is an instrument designed to continuously analyse air for the presence of combustible gases or vapours up to the lower explosive limit of the material in the air, giving an accurate indication of the degree of concentration. It can be adapted to operate above the lower explosive limit.

Equipment for measuring flow of liquids, etc., is shown in all its various forms by such firms as Nash & Thompson, Ltd., the Leeds Meter Co., Ltd., the Rotameter Manufacturing Co., Ltd., and Tylors of London, Ltd., while temperature sensing measuring and indicating devices are displayed by Coley Thermometers, Ltd., and Negretti & Zambra, Ltd. Mechanical and electrical types of industrial



(6) Nash & Thompson flow switch. (7) Besson & Robinson miniature mercury switch relay. (8) Sanders standing wavemeter. (9) Servis running and idle time recorder. (10) Electro Methods a.c./d.c. pneumatic time delay relay. (11) Pye d.c. nanoammeter and microvoltmeter

and marine tank contents gauges and level controllers are demonstrated by Simmonds Aerocessories, Ltd. Remote reading specific gravity meters are also demonstrated together with a new type of flow meter.

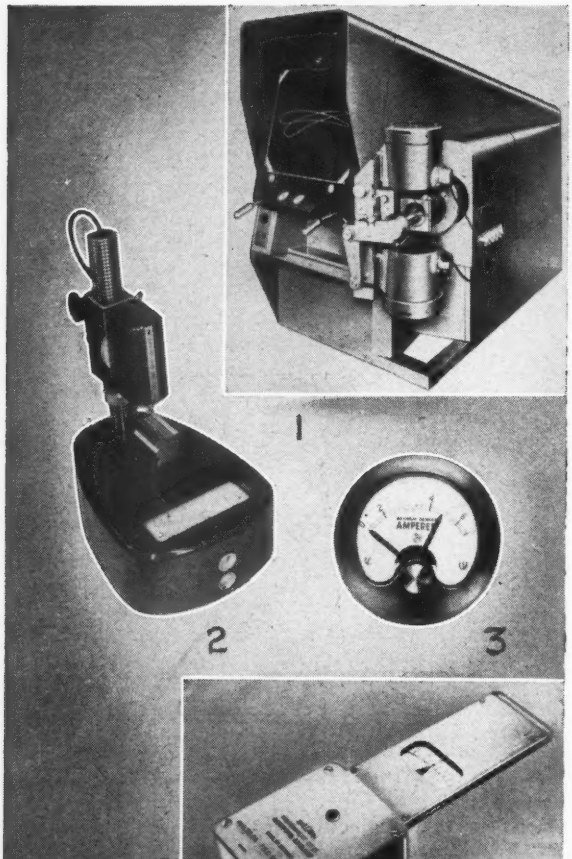
Relays form an essential of many control systems and on the stand of Electro Methods, Ltd., is an a.c./d.c. pneumatic time delay relay with a range of $\frac{1}{6}$ to 180 sec, a four-pole contactor capable of switching up to 30 A on each contact, cartridge thermostats, servo motors, magnetic amplifiers and a diversity of relays ranging from miniature polarized types operating from less than 10 μA to four-pole change-over types switching 15 A and operating from mains supplies. Among the exhibits of Besson & Robinson, Ltd., are several relays which will be useful in "automation" such as an impulse-operated or "memory" relay and a miniature mercury switch relay type J.02. This latter relay measures only $1\frac{3}{4}$in by $2\frac{5}{8}$in by 2in, has one or two 10 A switches, "Oilite" bearings, and a robust laminated chassis for a.c. or d.c. operation.

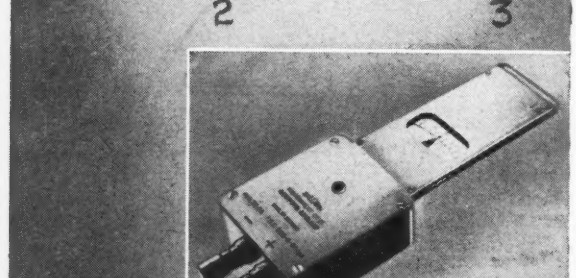
A wide range of relays for all manner of duties is shown by Hendrey Relays, Ltd., alongside a vibration table, a mercury vapour detector, the "Histokinette" automatic tissue processing equipment, and a selection of apparatus made for the Pyrene Co., Ltd. As would be expected Belling & Lee, Ltd., is showing its comprehensive range of accessories for use in electrical and electronic equipment, while Murex, Ltd., is showing some of the latest developments in sintered permanent magnets including multi-pole anisotropic annular magnets which are likely to have many applications in the instrument field.

Precision Measurements

One of the largest sections of the exhibition is devoted to precision instruments and the display emphasizes the extremely wide diversity of requirements which can be satisfied by British instrument makers. On the medical side C. Baker of Holborn, Ltd., is demonstrating a robot blood-cell counting machine which has been developed in collaboration with the Atomic Energy Research Establishment, Harwell. The count is given to a much higher degree of accuracy than is obtained visually; it is completed in 4 min, during which time about 20,000 cells are counted. An automatic blood-cell and particle counter is also shown by C. F. Casella & Co., Ltd., together with automatic biological assay apparatus and humidity and pressure measuring instruments. The medical equipment shown by the Metropolitan-Vickers Electrical Co., Ltd., include a Newton Victor PMX eye magnet for the removal of ferromagnetic bodies from the eye, a direct writing electrocardiograph, and the "Victrometer" X-ray dose meter. This latter instrument, the first of its kind of wholly British manufacture, is a portable quartz-fibre electrometer for operation from 230 V 50 c/s mains and is supplied with three thimble ionization chambers.

The latest precision d.c. vernier potentiometer shown by H. Tinsley & Co., Ltd., carries precision a stage further by sub-dividing to one part in two million. The a.c. potentiometers demonstrated by this company enable precision measurements to be made over the range 25 to 10,000 c/s. This provides a powerful tool for analysing circuits and calibrating meters at power and audio frequencies. A portable thermocouple potentiometer, a medium grade d.c. potentiometer, and a precision vernier potentiometer are shown by the Croydon Precision Instrument Co., while a universal bridge with self-contained 1 kc/s source and galvanometer detector, pH measuring, indicating and recording equipment, potentiometers and moving coil relays are amongst the exhibits of the Doran Instruments Co., Ltd. Amongst the new items shown by W. G. Pye & Co., Ltd., is a d.c. nanoammeter and microvolt meter which measures currents of the order of 10^{-9} A and voltages of the order of 10^{-6} V without using any





(1) Taylor, Taylor & Hobson turbine and compressor blade projector. (2) Sigma Instrument Co., Ltd., "Superset" electrical comparator for millionths of an inch accuracy. (3) Nalder Bros. maximum demand ammeter with fluid damping. (4) Baldwin "Magnimeter" large scale indicating instrument. (5) Ferranti-Shirley precision viscometer of the cone and plate type

external optical system. Consequently it is more convenient to use than comparable galvanometers.

Bellingham & Stanley, Ltd., have on view several of their more important instruments including spectrographs, spectrometers, refractometers and polarimeters, while Hilger & Watts, Ltd., has a direct reading attachment for its medium quartz spectrograph, a photo-electric spectrophotometer, a photo-electric absorptiometer and fluorimeter, and profile projectors. Among the items demonstrated by Taylor, Taylor & Hobson, Ltd., is a compressor and turbine blade projector. The blade section is delineated by a line formed round the blade either by projection from a slit or by marking with white paint, and an image of this line is projected on the screen at ×10 magnification. The images of two sections can be compared simultaneously with a master outline on the screen. In a similar field the Sigma Instrument Co., Ltd., is demonstrating its "Superset" electrical comparator which is designed for work such as the calibration of gauge blocks, where the accuracy required is within a few millionths of an inch. Apart from the "Pegasus" digital computer, switchboard instruments and the "Tesvac" h.v. h.f. vacuum tester, Ferranti, Ltd., has on view a portable viscometer and the Ferranti-Shirley precision viscometer of the cone and plate type. This instrument provides a continuously variable rate of shear over a wide range so it is extremely useful for the study of non-Newtonian materials.

Laboratory apparatus, equipment and instruments are to be seen on the stands of such firms as Baird & Tatlock (London), Ltd., J. W. Towers & Co., Ltd., Griffin & George, Ltd., A. Gallenkamp & Co., Ltd., and Townson & Mercer, Ltd.

Temperature Measurement

Among the items shown by the Sifam Electrical Instrument Co., Ltd., is a new hand pattern pyrometer indicator, the Sifam-Dunlop "Pyrominor." It is a small 2½in pyrometer weighing 5 oz, combined with a needle thermocouple, and it is particularly suited for checking the temperature of rubber and plastic articles. This firm is also showing a new thermocouple head which obviates many of the practical and technical difficulties often experienced in the use of thermocouples. For the measurement and control of temperature, instruments are shown by the Cambridge Instrument Co., Ltd., for almost every industrial requirement from the simple and inexpensive 4in dial thermometers to thermo-electric and optical pyrometers for measuring, recording and controlling the highest furnace and kiln temperatures.

Also in the heating field Electrothermal Engineering, Ltd., has heated rubber sheeting, armoured heaters, pipe heaters, heaters for stress relieving, and flexible, semi-rigid, and rigid heating panels and mats. This company also makes heating equipment for instruments and vessels of all shapes and sizes. Electric heating mantles of all types are shown by Isopad, Ltd. The cadmium oxide type of conductive glass made by Megatron, Ltd., has a resistance of about 100 Ω per square and about 90 per cent light transmission and is finding application on board ships for instrument windows. The company is also co-operating with the Triplex Safety Glass Co., Ltd., which will soon start the large-scale production of a different type of conductive glass in which the conductor is a thin layer of gold sandwiched between two layers of bismuth oxide. This has a resistance of 5 to 10 Ω per square with a light transmission of 80 to 85 per cent and will be used for windows and windscreens in civilian as well as service aircraft.

Water sterilizers which use ultra-violet irradiation to

destroy all forms of bacteria, fungi and viruses present in the water, without changing its chemical composition or taste are demonstrated by Hanovia, Ltd., together with a new photo-chemical reactor. This latter apparatus is designed for laboratory use for the preparation of compounds by means of ultra-violet or visible radiation.

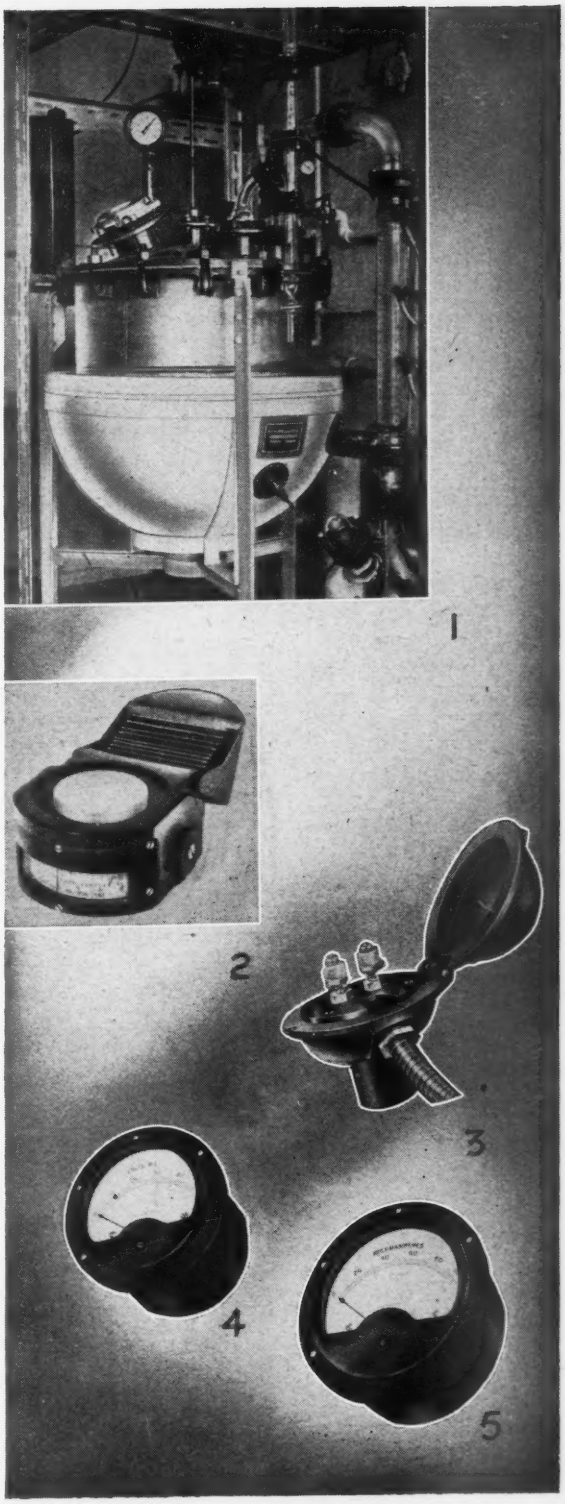
Indicating Instruments

As would be expected indicating instruments are to be seen in great profusion on many stands. For example, Everett, Edgcumbe & Co., Ltd., are displaying numerous types of movements in various sizes of case ranging between $2\frac{1}{2}$in and 6in diameter. The long or circular scale instrument is shown in both moving iron and moving coil patterns and a special display is made of platform type illuminated scales. The Record Electrical Co., Ltd., is exhibiting its well-known " Cirscale " range in which sizes from the " Mammoth " 30in dial down to the smallest ($2\frac{3}{4}$in) are shown. Not only moving coil ammeters, voltmeters and tachometers, but also " Cirscales " for measuring a.c. current, voltage, watts, frequency and power factor are included.

Among the diversity of indicating instruments shown by Crompton Parkinson, Ltd., are Admiralty pattern shockproof instruments, which include power factor indicators and synchronoscopes, and a new range of hermetically sealed circular scale instruments. These latter instruments will withstand a temperature range of -40 deg F up to $+158$ deg F under conditions of 95 per cent humidity and sustain without leakage an internal pressure differential of 10 lb/sq in. The exhibit of Nalder Brothers & Thompson, Ltd., includes relays, recording instruments, portable industrial and precision instruments and panel mounting meters for all types of electrical measurement. To mention but a few there are flameproof instruments, hermetically sealed instruments, service type instruments and maximum demand ammeters with fluid damp.

The new instruments for switchboard and panel mounting and portable use in laboratory and industry shown by the English Electric Co., Ltd., include a rotary synchronoscope, a tap position indicator, two types of temperature indicator for use with thermocouples and resistance elements respectively, and a portable pocket-size phase-sequence indicator. Smiths Industrial Instruments, Ltd., show its " Desynn " electric recorder for the collation of information from up to six different sources, and a tachometric recorder for the indication of rotational speeds. A comprehensive selection of laboratory standard, sub-standard, portable, panel, switchboard and miniature instruments are shown by Sangamo Weston, Ltd., together with many interesting developments in aircraft instruments, moving coil relays, hermetically sealed instruments and photo-electric exposure meters. Among the photo-electric instruments shown by Evans Electroselenium, Ltd., is a daylight factormeter developed in conjunction with the Department of Scientific and Industrial Research to provide a compact and portable means of determining the daylight factor in buildings.

An interesting item shown by the Baldwin Instrument Co., Ltd., is the " Magnimeter " which has been designed to meet the need for a large-scale indicating instrument visible from an appreciable distance, for technical schools, colleges, laboratories and factories. The basic movement has a full scale deflection of 500 μA and it is made to fit most commercial film strip projectors, having a slide carrier $2\frac{1}{32}$in wide by $\frac{1}{4}$in thick. With projectors having a rotating slide carrier, the scale can be projected either horizontally or vertically. The pointer can be adjusted to give zero at one end or in the centre of the interchangeable transparent scale.



(1) Isopad, Ltd., " Isomantle " on 30 gal stainless steel reaction vessel in flameproof area. (2) Evans Electroselenium daylight factor meter developed in conjunction with the Department of Scientific and Industrial Research. (3) Sifam Electrical Instrument Co., Ltd., thermocouple head. (4) and (5) Two examples of Sangamo Weston hermetically sealed instruments

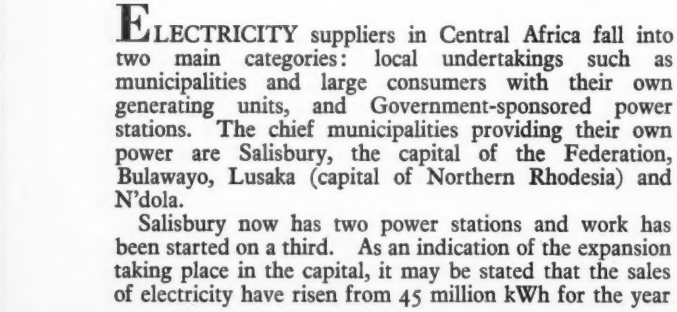
WORLD ELECTRICAL MARKETS

The Central African Federation

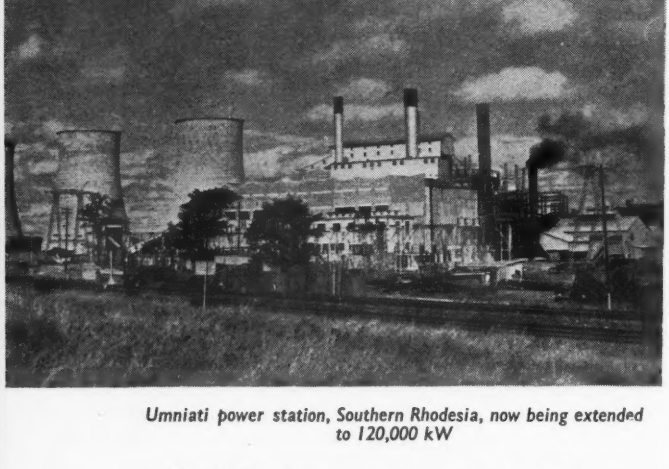
By F. B. D'ENIS*

ELECTRICITY suppliers in Central Africa fall into two main categories: local undertakings such as municipalities and large consumers with their own generating units, and Government-sponsored power stations. The chief municipalities providing their own power are Salisbury, the capital of the Federation, Bulawayo, Lusaka (capital of Northern Rhodesia) and N'dola.

Salisbury now has two power stations and work has been started on a third. As an indication of the expansion taking place in the capital, it may be stated that the sales of electricity have risen from 45 million kWh for the year ended June, 1945, to an estimated figure of 181 million kWh for the current year, about 75 per cent of which is represented by domestic consumption. The consumption per domestic consumer is amongst the highest in the world.



Umniati power station, Southern Rhodesia, now being extended to 120,000 kW



Wankie Colliery with coke ovens in foreground

The other main source of supply, the Electricity Supply Commission of Southern Rhodesia is a Government-sponsored organization which operates power stations in various parts of the territory. These stations are situated at Umniati, Gwanda, Umtali, Gwelo, Shabani and Chipinga. Of these by far the largest is Umniati, which is still in process of construction. At present this station has a capacity of approximately 60,000 kW, but when completed this figure will be doubled. The total installed capacity of all E.S.C. stations at the end of March, 1954, was 109,870 kW.

The E.S.C. is responsible for supplying power to practically every town or district in Southern Rhodesia, and its transmission lines cover some 6,406 route miles. The Commission's system is also connected to the Salisbury-Bulawayo network which permits an interchange of power, leading to more economical operation. In its first year of operation (1936-37) the Commission sold 142,210 kWh; in 1953-54 its sales totalled 467 million kWh.

The Commission's main consumers are the mines, which take about half of the output. Mining is one of the major industries of the Federation and such minerals as gold, chrome, copper, tin, asbestos, iron and coal are to be found in many parts of the territory. The industry is firmly established, especially in the case of the main minerals, i.e., gold, coal, chrome and asbestos. Output values of these four minerals for last year were as follows:—Gold £6,667,000; chrome £2,500,000; asbestos £5,900,000; and coal £2,700,000. The total value of the mineral output was £18,700,000.

Of the other large industries agriculture is perhaps the most important. Rhodesia is one of the major tobacco producing countries of the world and this crop is very important to the financial well-being of the country. Another crop that is being developed is cotton, and the Government has established a modern ginnery and spinning mills in Gatooma. As a result, numerous weaving mills have been built in and around the town. This district draws its electrical power from the Umniati power station and all mills have electrical installations. Unfortunately the last few seasons have produced very poor crops.

Another growing industry is the Rhodesian Iron and Steel Commission's works near the town of Que Que. "RISCOM" is a Government-sponsored organization, and produces pig iron and steel from nearby deposits of iron ore. RISCOM was originally planned for a limited production, but owing to the demand for a variety of its products, coupled with high costs resulting from small scale operation, a programme of expansion was embarked upon. For example the original 9ft diameter blast

* F. B. d'Enis & Associates, consulting engineers, Salisbury, Southern Rhodesia.

furnace was supplemented by a second one of the same size in April last year. The existing open hearth furnace had a capacity of 25 tons and it is hoped to bring into operation shortly a second open hearth furnace with a capacity of 75 tons. One result of this expansion is that the output of RISCOM will be increased from 40,000 tons of pig iron to an estimated maximum of 80,000 tons per year, and similarly from 30,000 tons to an estimated 56,000 tons per year of ingot steel. A survey in 1952 estimated that the annual demand for rolled products will reach 150,000 tons in a few years' time.

A recent additional major consumer of electric power is the factory of Rhodesian Alloys (Pvt.), Ltd., at Gwelo where alloys of local minerals are processed in a rotary kiln and electric furnaces and shipped to steel plants in the United States and the United Kingdom. Cement factories at Gwanda and Bulawayo are considerable users of power; a factory in Northern Rhodesia generates its own power at present.

In the Copper Belt power is generated at thermal stations owned by the mining companies and is supplemented at present by purchased supplies from hydro-electric schemes in the Belgian Congo. There is one mill at present drawing copper wire in Salisbury, and soon it will co-operate with a plastics concern to produce p.v.c. insulated wire.

There are many other industries in Southern Rhodesia, ranging from the manufacture of plastics products to radio sets, from jute mills and paper mills to concrete products and clothing factories.

Nyasaland is the least developed industrially of the three territories in the Federation. With the potential power available from the projected Shire Valley hydro-electric scheme there can be no doubt that industry in this territory will expand. Its proximity to the coast and the thriving tea industry will be major factors in this expansion.

The total value of all types of electrical goods imported into the Federation in the period January-September, 1954, was £5,667,042, and can be summarized as follows:—

Country of Origin	Engineering Equipment	Domestic and Other	Total
United Kingdom	£2,199,959	£1,899,419	£4,099,378
South Africa	£349,448	£906,361	£1,255,809
Others	£93,988	£217,867	£311,855

Engineering goods are mainly batteries, motors, transformers, etc. The remainder of the goods were cables and wires, conduit and conduit fittings, lamps, communication equipment, domestic radio sets, washing machines, stoves, refrigerators, etc.

The Federation as a whole uses domestic electrical goods to a very great extent. Refrigerators, stoves, washing machines, and radio sets are considered by many people as necessities, especially the first two articles. Most houses have electric water heaters installed. In fact, so many are in use in Salisbury that the Municipality has installed over 5,000 high-frequency ripple relays to switch off water heaters during peak loads. The United Kingdom is by far the largest supplier of all types of equipment. The biggest imports from the Union of South Africa are electric stoves, refrigerators and cables.

At present all electricity produced in the Federation is from thermal stations. Rhodesia possesses vast deposits of coal at Wankie, which are being exploited by the Anglo-American Group. The main drawback to coal supplies at the moment is transport, as all coal is delivered by rail. Enormous distances are involved and the strain on the single-line railway system is very great.

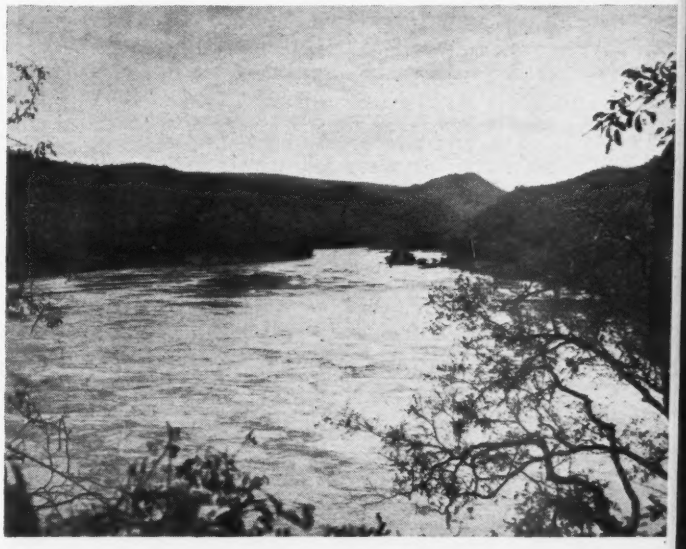
However, the Prime Minister of the Federation recently announced that the Government intends to go ahead with the Kariba Gorge scheme for hydro-electric power from the Zambesi River. The initial stage, costing about £54 million, would provide 462 MW. As there is also a smaller scheme for developing power from the Kafue River, there has been considerable controversy regarding the merits of both schemes.

It is hoped that power will be available from Kariba by 1961, or sooner; otherwise the great copper mining companies in Northern Rhodesia will be severely handicapped in their expansion by lack of power and fuel arising from the difficult transport problem, and the growing demand for fuel from Wankie throughout the Federation.

The author is indebted to the Information Department of the Federal Government of the Rhodesias and Nyasaland for the photographs used to illustrate this article.

Cotton spinning mills at Gatooma; a ring room containing 17,000 spindles

Upstream entrance to the Kariba Gorge on the Zambesi River



Water Pollution

Opening of New Research Station at Stevenage

THE developments now taking place in the generation of electricity from atomic energy will greatly increase the quantities of radioactive waste materials produced. The importance of this problem was stressed by the Lord President of the Council, Lord Salisbury, when he opened the new Water Pollution Research Laboratory at Stevenage on 20th June. Lord Salisbury described the problem as one which was not in the least insuperable but which required very special care and attention.

As the member of the Government who was predominantly responsible to Parliament both for the D.S.I.R. and for the Atomic Energy Authority, he looked forward with particular interest to the results of the laboratory's researches on methods of dealing with radioactive waste. He was pleased to hear from the director, Dr. B. A. Southgate, that the laboratory was already in consultation with the Minister of Health and Minister of Housing and Local Government on the siting of generating stations, in order to ensure that the radioactive waste would be disposed of without danger or even embarrassment to the public.

The laboratory has also been asked by the Government to undertake an investigation of the fate of radioactive substances discharged into rivers and streams. Among questions to which answers are required are whether the substances are absorbed in mud and silt, whether they are taken up by plants and animals, and whether absorbed material is released at a later date.

Radio-Chemical Investigations

The probability that work of this nature would be required was recognized some years ago, when the new buildings at Stevenage were being planned. One of the pilot-scale laboratories has therefore been designed for radio-chemical work and is provided with the necessary rooms for counters and for the chemical manipulation of radioactive substances. It is hoped to start the investigation of radioactive wastes during the current year.

At the laboratory's former premises at Watford, the flow of liquids was controlled by electro-magnetic valves actuated by motor-driven time switches. In the new buildings the timing circuits are governed by a central clock which carries two contact points and in each laboratory there are points from which impulses at intervals of 1 sec or 30 sec can be obtained. These can be made to actuate a light relay which itself governs the operation of electro-magnetic valves. The central clock also drives the time clocks throughout the research station.

The development of automatic equipment is an important part of the laboratory's work. One of the most effective ways of tracing the recovery of a stream from the effects of pollution is to determine the concentration of dissolved oxygen in the water as the stream flows away from the point of discharge of the polluting matter. There is thus a need for an instrument which will determine continuously, or at frequent intervals, the concentration of dissolved oxygen in a stream.

In the method finally adopted by the laboratory a sample of water is taken automatically, a solution of a manganous salt and an alkaline solution of iodide are added to it, and the mixture is acidified. Iodine is then released in an amount proportional to the concentration of oxygen originally present.

The apparatus developed for this purpose contains a reaction cell into which a fresh sample of the water to be tested is pumped automatically every ten minutes. The reagents are added in turn by means of electrically operated dosing pipettes, the additions being controlled by a uni-selector switch. The movements of the switch are governed by the closing of contacts by a Synclock motor. After the liquid has been acidified and the iodine released, about one-third of the contents of the reaction cell is run into a photometric cell through which a beam of light is passed. The beam is interrupted 300 times a second by a rotating slotted disc, so that the output from the photocell is an alternating current. This is amplified in a four-stage amplifier and is converted to a direct current, which is recorded on a chart.

The reason for this complication is that an a.c. amplifier can be made to operate at a much more constant amplification factor than can a d.c. type. In this way it has been possible to magnify 5 μA to 5 mA in a stable manner and to record this small current on equipment of a normal commercial type. The amplifier can handle inputs between 0·1 and 5 μA.

The absorption of light in the photometric cell is due partly to the iodine liberated and partly to any colour or turbidity which may have been present in the water initially. After the light absorption has been recorded, sodium sulphite is therefore added automatically to the solution remaining in the reaction cell to destroy the colour due to iodine. The absorption of light by colour or turbidity is then measured on the photometric cell and this value is also recorded. The concentration of dissolved oxygen is measured by the difference between the two values so obtained.

Examination of Surface Waters

The Water Pollution Research Laboratory is investigating the quality of surface water draining from built-up areas during rain. When rain begins to fall the first flush of run-off water is likely to be dirtier than the subsequent flow. This important first flush is often missed if samples are collected by hand and automatic apparatus has therefore been installed at the flow-recording station.

The sampler is set in operation by a sensitive relay when the water flowing through a measuring flume rises and makes contact with an electrode set at a predetermined level in a float chamber. It then collects samples of water from the flume at intervals of five minutes during the first hour of each rain storm and thereafter at hourly intervals until the rate of flow in the flume falls below a predetermined minimum or until all the sample bottles are filled. The timing unit, designed and made by Londex, Ltd., incorporates a clock giving one revolution in five minutes and another arranged for one revolution each hour. By means of contacts operated by a cam on the 5-minute clock, and microswitches on the hour clock operated by contact bars rotated through an electromatic clutch, these two clocks control the operation of a delay circuit, thereby maintaining the current in the external sampling equipment for a predetermined time. If at any

time the level of the water in the flume falls below the predetermined level the timing unit is switched off. Should it be restarted again by a second rise in the water level, the timing unit will again start to operate on the 5-minute cycle.

When the current is switched on by the timing unit, a sampling pump delivers water to a vessel having a capacity equal to about twice the combined volume of the pump and its suction and delivery pipes. When this vessel has been filled it has collected all the stagnant water from the pumping system. A float then rises and deflects the flexible inlet pipe so that water is now delivered into a second vessel with an overflow to waste and an outlet to a rack of 36 sample bottles.

The sample bottles are arranged in a close-packed double row round the circumference of a circle and underneath a fixed circular distributor in the form of a shallow cone. At the apex of the cone is a rotating funnel carrying an outlet pipe which discharges to one of the 36 channels of the distributor. The funnel is mounted on a Londex stepping mechanism, which moves through 10 deg of arc at each step and which is in the same circuit at the pump motor. Each time the pump operates to take a sample, the distributor pipe thus moves to discharge into a channel leading to a fresh bottle.

When the last bottle is being filled, the rotation of the funnel opens a limit switch which switches off the timing unit, thus preventing further samples from being taken. This switch differs from the main on-off switch in that it does not switch the primary of the transformer controlling the external circuit and thus does not interfere with the collection of the final sample. The time of sampling is recorded by an operation recorder, which is also in the same circuit as the pump.

In the examination of surface waters and effluents it is often desirable to take samples at frequent intervals throughout a period of 24 hours or more. An automatic sampler recently devised at the Water Pollution Research Laboratory has a battery operated mechanism, with a spring clock as the timing mechanism.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Domestic Heat Pumps

AS makers of the "Type 1" heat pump referred to in Mr. B. Z. de Ferranti's letter in your 1st July issue, we feel called upon to question the claims he makes for the advantages of the "Type 2."

Our "Duo-Therm" heat pump is larger in overall size, it is true, but it provides in one packaged unit an eye-level refrigerator of 2½ cu ft capacity and a 32 gal lagged hot water storage tank. Our heat pump runs constantly to ensure even larder temperatures and adequate hot water without the necessity for using an immersion heater as an adjunct. Our "expensive heat leak arrangements" consist of a few loops of piping in the airing cupboard. In addition, the "Duo-Therm" has sufficient output to run a towel rail in the heat-leak circuit if this is required.

To cope with variations in ambient temperature we include an automatic valve (patent applied for) which controls our heat leak. In the "Type 2" installation the user presumably varies the amount of lagging on the separate airing cupboard storage tank to cope with such variations.

Mr. Ferranti's tables of figures look impressive at first sight, but he is not really comparing like with like.

London, S.E.3. I. C. GRAY,
Brentford Electric, Ltd.

Modern Meter Testing

FROM Mr. C. H. Forster's letters (*Electrical Review*, 6th May and 24th June) it seems a fair assumption that he thinks that long-period dial testing is the only satisfactory way of testing meters, but a comparison of his letters suggests that he is now tending to be motivated more by faith than reason.

I should like him to be more enthusiastic now about the stroboscope/counter method, but if he must wait for the statutory period for a performance comparison, which I think at the moment means waiting for ever, I have every confidence that he will ultimately be convinced that the method results in as good a product as any other, but is very much quicker. For less patient mortals, of course, engineering progress often dictates a move forward on the soberly reasoned conviction that an idea is a good one.

On the necessity for an electrical dial test to eliminate register defects, may I make two pertinent observations—first, that in the Chicago meter test room there is a standing rule that anyone who finds a wrong register gets a free lunch, and second, that I have recently heard of a *certified* meter which was alleged to be registering ten times too much! The Meters Act did not eliminate the latter—a mechanical test and a free lunch probably would have done so.

If Mr. Forster will consider the reason for the word "effectively," and mentally insert "per meter" after "test time" in my sentence regarding low-load testing, I think the meaning of this sentence will (after the statutory period?) become clear to him.

London, S.E.1. H. S. PETCH.

The Power Engineer's Status

THE correspondence on the subject of status of power engineers prompts me to point out that an effective organization already exists to watch over interests where status is really deserved, namely, in the case of those true engineers who have taken the trouble to become professionally qualified. Membership of this body, the Engineers' Guild, is restricted to members of the three major engineering institutions.

The Engineers' Guild, unlike the E.P.E.A., is not a trades union and is, in fact, organized on similar lines to the B.M.A. and the Law Society. It is, therefore, better suited than a trades union to deal with professional status which, let it never be forgotten, is actually gained not by demanding it, but by earning it through unselfish public service coupled with a rigid code of professional conduct

calculated to foster public trust. The efforts of a trades union, however well meaning, will always depress professional status because the primary concern of a trades union is financial gain and easier conditions of work whereas the Engineers' Guild is primarily concerned with status, in other words, with cause and not with effect.

It is also as well to remember that membership of a trades union confers the right to strike. The mere possession of the strike weapon automatically lowers status since it is the very negation of the personal integrity and loyalty on which professional conduct is based.

Bedford. J. J. THOMPSON.

IN reply to Mr. Palmer's letter in your issue of 1st July, I honestly fail to see what useful purpose would be served by publication of details of improvements in salary in respect of individual members of the N.J.B. staffs since vesting day. After all, each of us is fully aware of our present-day salary as compared with that on vesting date. Again, practically all employed persons in this country are now receiving higher wages or salaries than on 1st April, 1948, due to the so-called " higher cost of living."

I think most people would agree with me on that, although some have received less in proportion to their 1948 income than others, and this, I submit, applies to a considerable number of the N.J.B. staffs. I must say though, after due thought, that I now consider the only sure and proper course is for N.J.B. staffs to join the E.P.E.A.; an Association depends for its strength and life on members, and, most important, subscriptions.

As Mr. Palmer so aptly puts it, if we want the " tune " we like, we have to " pay the piper " in this case the E.P.E.A.

" F. & D. (and now hopeful)."

AS an official of N.A.L.G.O. I naturally appreciate the commendations in " F. & D.'s " letter in your 1st July issue.

I feel I ought, however, as staffs' and joint secretary of the National Joint Managerial and Higher Executive Grades Committee, to point out that the increases he refers to were negotiated collectively through that body by the three Associations represented on it—which include the E.P.E.A.

London, N.W.1. L. G. MOSER,
Staffs' and Joint Secretary,
National Joint Managerial and
Higher Executive Grades Committee.

[This correspondence is now closed.—Editors, *Electrical Review*.]

Electric Vehicle Progress

Association's Annual Report

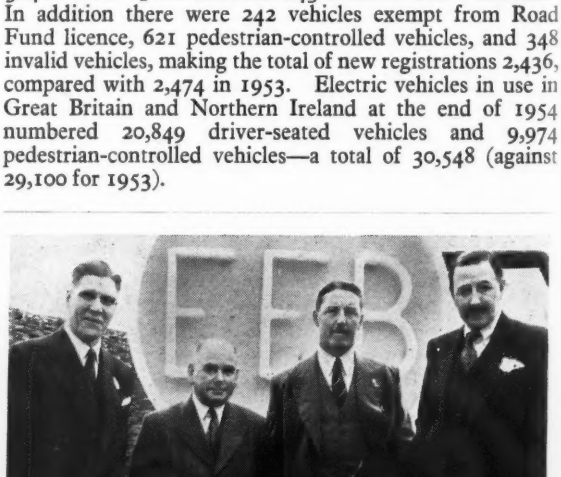
THE report of the Electric Vehicle Association of Great Britain for the year ended 31st December last, presented at the annual general meeting on 24th June, shows that the number of full members at the end of the year was 27 (against 29), and of associate members 17, including the B.E.A.M.A. (against 26).

Advertisements were placed in a number of users' trade journals and 102 requests were received for the booklet " The Electric Vehicle Reduces Local Delivery and Collection Costs." Electric vehicles, batteries, etc., were shown at a number of exhibitions, including the Royal Show at Windsor, the Dairy Show, the British Electrical Power Convention, and the Institute of Public Cleansing Conference Exhibition.

Negotiations continued with the Ministry of Transport regarding anomalies in connection with driving licences and the operation of pedestrian-controlled vehicles. At the request of the Ministry, the Association submitted its observations on such matters as regulations governing direction indicators and stop lights, amendments to the Motor Vehicles (Construction and Use) Regulations, proposals regarding road traffic and road safety generally, and proposed exemptions for parked vehicles.

The journal *Electric Vehicles* was revived as a quarterly in March, 1954. The possibility of expanding the Association's scope and membership was considered by the *ad hoc* Committee which was appointed to examine the matter and by the Executive and Finance Committee. The *ad hoc* Committee explored the possibility of including industrial truck manufacturers, but this proposal did not reach maturity as the Industrial Truck Manufacturers' Association decided to expand its activities. The possibility of including as members makers of auxiliary equipment, such as axles, tyres and wheels, etc., was examined by the Executive Committee.

An appendix to the report gives information, provided by the Ministry of Transport, of vehicle registrations. New registrations totalled 1,225, of which the largest class was the 12-16 cwt (unladen weight) type (395); there were 364 in the 1-1½ ton class and 243 in the 16 cwt-1 ton class. In addition there were 242 vehicles exempt from Road Fund licence, 621 pedestrian-controlled vehicles, and 348 invalid vehicles, making the total of new registrations 2,436, compared with 2,474 in 1953. Electric vehicles in use in Great Britain and Northern Ireland at the end of 1954 numbered 20,849 driver-seated vehicles and 9,974 pedestrian-controlled vehicles—a total of 30,548 (against 29,100 for 1953).



Among the many guests who visited the Eastern Electricity Board's Stand at the Royal Norfolk Agricultural Show on 29th and 30th June were (left to right), Mr. J. A. Sumner (manager Norfolk Sub-Area), Mr. H. C. Waters (deputy chairman), Mr. W. Newcome-Baker (member of the Board), and Captain W. A. Fellowes (agent for the Sandringham Estate)

VIEWS on the NEWS

By REFLECTOR

SUPPLEMENTING his Power Convention paper on the next ten years' developments in electricity supply Mr. J. Eccles (the new vice-president of the Convention) gave what I thought to be one of the clearest expositions of nuclear power plant I have heard or read. His drawings, projected on a screen, indicated very effectively the different kinds of reactors and steam-raising plant. Most dramatic was the sudden switch from the "atomic" diagrams back to the present-day power station which, by contrast, was made to appear quite primitive. Although the paper forecast a really remarkable expansion in the next decade Sir Claude Gibb thought that Mr. Eccles had not been "sufficiently electrically minded" or optimistic enough.

* * *

It is apparent that in the minds of the electricity supply people "the native hue of resolution is sicklied o'er with the pale cast of thought." In other words the desire to encourage the use of electricity is dogged by the dread shadow of past load-shedding. This must not continue; Mr. Eccles said at Brighton that load-shedding must be forgotten. If it is not we shall see (to continue Hamlet's soliloquy):—

> "Enterprises of great pith and moment
> With this regard their currents turn awry
> And lose the name of action."

Let us (as Mr. Beard advocated) once again envisage the all-electric house with a continuous uninterrupted supply on economical lines. If heating is the main obstacle to this there should be further research into electrical warming methods to secure results at a cost comparable with that of other agents.

* * *

Electricity Consultative Councils are in much the same position as public relations officers; they are looked upon either as links between the Electricity Boards and the consumers or (perhaps more generally) as iron curtains separating the two parties. It was asked at the "Electrical Forum" whether the Councils should not be more independent of the Boards and given executive authority. I do not know what sort of authority was in the questioner's mind but the panel appeared to assume that he wanted the Councils to give the Boards orders instead of suggestions. Mr. Palmer thought that the purpose of the Councils would be served by making membership of the Boards more representative, but Mr. Eccles pointed out that the part-time members were already appointed on this basis. Mr. King thought that the Councils were doing excellent work under their present terms of reference. I would not like to see the Councils with more power than they have at present, but a little more independence of the Boards might be desirable in some cases.

* * *

Some years ago the Electrical Development Association ran a "Wiring the Homes of Britain" campaign to inculcate the idea of adequate installations. I believe that it had some influence at the time on architects and builders, as well as the general public. It is evident that any effects of that campaign have become very attenuated for to-day multiple plugs and festoons of flex are taking the place of the extra outlets which are needed. Mr. H. W. Swann introduced this point in his contribution to the discussion on Mr. R. A. Marryat's paper and later the subject was dealt with in the "Electrical Forum." Mr. C. R. King said there that only an extensive advertising campaign would alter the position but the advertisement allocation was needed for other purposes. I do not agree with the implication that adequate wiring is secondary to something else. The very existence of outlets waiting to be filled sells appliances and energy. If the electricity supply authorities cannot or will not act perhaps the electrical contractors can do something about it. If they do they should impress upon the public that there must also be adequate wiring behind the sockets, as Mr. Eccles reminded the audience.

* * *

It was Lord Kelvin, I believe, who said in effect that when we could measure something we began to know something about it. One need not hark back to the days—not really so long ago—when specifications required steam-engine cylinders to be "well and truly bored," and when $\frac{1}{16}$in or so represented a workable tolerance for many engineering devices, to be impressed with recent advances in measurement, and hence control of processes, displayed at the British Instrument Industries Exhibition this week. Credit for progress must be allowed to electricity which lends itself readily to exact determination, first, of its own performance when used as a substitute for older methods and, secondly, less directly, to the performance of mechanical apparatus. Also modern practice generally tends to conform to the higher standard of precision thus established.

* * *

Modern electrical instruments contrast strangely with those of seventy years ago. At an inventions exhibition in 1885 the apparatus displayed included Ayrton and Perry ammeters and voltmeters, a Paterson electro-magnet ammeter, Paterson-Joel ammeters and a Thompson and Starling universal photometer. An example of the photometer was illustrated in the *Electrical Review* of 4th July of that year. It consisted of a graduated bar at the centre of which were fixed, back to back, two opaque screens, one of which received the light to be measured while on the other fell the light of two candles. By adjusting the positions of the candles and of the light to be measured, it was possible to ascertain their relative intensities. No details, however, were given of another ingenious device mentioned in the same issue:—

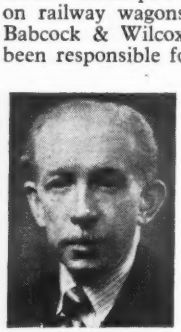
> "A Missouri lady, according to American information, has taken out letters patent for an electric indicator which, when attached to the bedpost, will show at a glance whether there is a horrid man under the bed. Our contemporaries think that the saving in time in a year will more than pay the cost."

PERSONAL AND SOCIAL

News of Men and Women of the Industry

At last week's annual meeting of the Southern Areas Electric Corporation, Ltd., Lord Gridley (chairman) announced that **Mr. J. W. C. Milligan,** B.Sc., M.I.E.E., had been elected to the board and had been appointed as an executive managing director. Mr. Milligan was with the English Electric Co., Ltd., for twenty-five years and from 1944 to 1949 was manager of the Stafford works of the company. In the last-mentioned year he became general manager of the Brush Electrical Engineering Co., Ltd., and relinquished this position in October last.

Mr. R. J. Glinn, M.I.Mech.E., has retired after forty-four years with Babcock & Wilcox, Ltd. He has also retired from the board of the Calorizing Corporation, of which he has been a director since 1928. Leaving University College, London, with first-class honours in mechanical engineering, Mr. Glinn joined Babcock & Wilcox as a student apprentice at Renfrew in 1911 and subsequently obtained experience in London and at the Oberhausen works of the Deutsche Babcock & Wilcox, Dampfkesselwerke A.G. In the 1914-18 war he served as a lieutenant in the Royal Engineers, one of his most interesting assignments being the supervision of the construction and operation of three mobile steam power stations mounted on railway wagons. He returned to Babcock & Wilcox in 1919. He has been responsible for much pioneering work on oil firing, on pulverized fuel, and on the development of automatic soot-blowers. From 1926 onwards he was in charge of investigations into the effects of impurity in feed water, and he is a recognized authority on the phenomena of caustic cracking in steam boilers. Mr. Glinn was a member of the Admiralty Committee on Boiler Corrosion, and of the Industrial Water Committee of Investigation set up by the British Iron and Steel Research Association. He has also served on a number of committees of the British Standards Institution.



Mr. R. J. Glinn

The Minister of Fuel and Power has appointed **Professor W. R. Hawthorne,** M.A., to be a member of his Scientific Advisory Council. The Council was set up in 1948 to advise the Minister on the scientific aspect of his statutory duties. Professor Hawthorne, chairman of the Fuel Research Board of the Department of Scientific and Industrial Research, has been Professor of Applied Thermodynamics, University of Cambridge, since 1951. He was educated at Westminster School, Trinity College, Cambridge, and the Massachusetts Institute of Technology, United States. He was formerly Associate Professor of Mechanical Engineering, 1946, and George Westinghouse Professor of Mechanical Engineering, 1948, at the Massachusetts Institute of Technology. He was awarded the Medal of Freedom (U.S.) in 1947.

Mr. J. W. Skinner and **Mr. E. W. Betts** have been appointed directors of the Stoat Manufacturing Co., Ltd.,

Mr. J. W. Skinner

Mr. E. W. Betts

and Alfred Owen & Co., Ltd., the associated manufacturing concerns of Bromley-Langton. Both have been with Bromley-Langton for many years and they will continue to act in their present capacities as general manager and as sales executive respectively.

Mr. A. F. C. Williams is joining the British Central Electrical Co., Ltd., as personal assistant to the managing director on 11th July. For the past ten years he has been with the Automatic Coil Winder & Electrical Equipment Co., Ltd.

In our issue of 24th June we reported that **Mr. H. C. Van de Velde** was retiring from the position of deputy to the managing director of the Marconi International Marine Communication Co., Ltd. To mark his retirement a dinner was given recently by Mr. F. N. Sutherland, general manager of Marconi's Wireless Telegraph Co., Ltd., at which many of the chief executives attended.

Mr. D. G. Welton has left the Stoke-upon-Trent sub-office of the English Electric Co., Ltd., to take up an appointment in the London branch office of the company. **Mr. R. Edwards,** previously with the Birmingham branch office, has taken charge of the Stoke-upon-Trent sub-office.

Mr. R. E. G. Weddell, joint managing director of W. G. Allen & Sons (Tipton), Ltd., has been elected president of the Institute of Welding for 1955-56. **Sir Charles Lillicrap,** K.C.B., M.B.E., D.Sc.(Eng.), former director of Naval Construction, has been elected vice-president.

Mr. Robert C. King, Ph.D., has retired from the board of the Consolidated Pneumatic Tool Co., Ltd., as from 1st July. **Mr. C. L. Fisher** has been appointed to the board of the company. He has been manager of the British Sales Division since 1951 and has been with the company for about forty-two years.

Mr. J. Wilson, M.I.E.E., managing director of the Wilson Electric Transformer Co. (Pty.), Ltd., Melbourne, Australia, has arrived in this country and will be staying for several months. His address is Goldthorne House, Crowthorn Road, Bracknell, Herts.

Mr. J. S. Abbott has been appointed a director of Glenfield & Kennedy Holdings, Ltd., and of Glenfield & Kennedy, Ltd.

Mr. H. Campbell, chairman of **Campbell & Isherwood, Ltd.,** Bootle, recently presented gold watches to thirty-six members of the staff who have completed more than thirty years' service.

Mr. M. J. Burke, A.M.I.E.E., Bedford, has been appointed regional

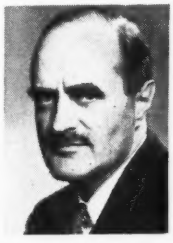
Mr. Van de Velde speaking at the dinner given in his honour. On his left are Mr. Sutherland and Mrs. Van de Velde, and on his right, Mr. S. Aisenstein, general manager, English Electric Valve Co., and Mr. G. M. Wright, chief technical consultant, Marconi's Wireless Telegraph Co.

Heads of national delegations to the I.E.C. meetings attending the Power Convention dinner

principal electrical engineer to the East Anglian Hospital Board, Cambridge.

Mr. L. G. Bettinson, export manager of Berry's Electric, Ltd., recently left London Airport on the first leg of his Middle East tour. He will visit Kuwait, Iraq, Persia, Egypt and the Lebanon.

Mr. Harold Bishop, director of technical services, B.B.C. (who received a knighthood in the recent Queen's Birthday Honours), has accepted the presidency of the Electrical Industries Benevolent Association for the ensuing year. **Mr. H. A. Deacon** has been re-elected chairman of the Court.



Mr. H. Bishop

Sir Harold West has announced his intention to retire from the managing directorship of Newton Chambers & Co., Ltd., in the near future. **Mr. P. J. C. Bovill,** an assistant managing director and general manager of the Chemicals Division, has been appointed to the board with a view to his eventually succeeding Sir Harold West.

Mr. H. H. Eggers, C.M.G., O.B.E., has been appointed a managing director of Cable & Wireless, Ltd., to serve jointly with Mr. N. C. Chapling, C.B.E., who was appointed in 1951. Mr. Eggers joined the court of directors in March, 1954.

In appreciation of his fifty years' service with the company, **Mr. William F. Smith,** works accountant to Johnson & Phillips, Ltd., was presented with a radiogram on behalf of the directors of the company, on 28th June, by Mr. G. L. Wates, J.P., Companion I.E.E., the chairman.

Mr. J. M. Crabbe has been appointed a director of the East African Power & Lighting Co., Ltd.

Heads of national delegations to the London meetings of the **International Electrotechnical Commission,** and their ladies, attended the annual dinner of the British Electrical Power Convention at Brighton on Thursday last week. We reproduce a photograph which we took on the occasion. The group includes the president of the Convention, Sir Harry Railing, Col. B. H. Leeson, chairman of the British National Committee, and Mr. W. J. Jones, chairman of the Organizing Committee for the London meetings.

The annual ball of the Essex Branch of the **Electrical Industries Benevolent Association** is to be held at the Queens Hotel, Westcliff-on-Sea, on Friday, 21st October. The reception will be at 6.30 p.m. and following dinner there will be dancing until 1 a.m. Further details will be announced shortly.

Over 250 parents and friends of apprentices of the **British Thomson-Houston Co., Ltd.,** at the Willesden works accepted invitations to the annual Parents' Day last Saturday. The visitors were conducted around the works by apprentice guides, and after tea were officially welcomed by Mr. E. Alexander (manager, Willesden works). Chief guest of the afternoon was Mr. H. L. Satchell (deputy director of manufacture), who gave a short address and presented certificates and prizes to the apprentices who were this year successful in the annual essay competition. The Apprentice Association was responsible for the organization of the afternoon's activities, and Mr. J. R. Alderton (ex-chairman of the Association) thanked everyone for their help and support. He presented a bouquet to Mrs. Satchell, who had accompanied her husband.

A Parents' Day for college and school apprentices of the **Metropolitan-Vickers Electrical Co., Ltd.,** took place at the Trafford Park works on 2nd July. About 300 parents, with their sons acting as guides, made a circular tour of the works, visiting the main manufacturing departments and research laboratories, and also the Education Department and the Apprentice Training School. At present over 600 apprentices, more than 200 of whom are university graduates, are engaged on professional engineering courses with the Metropolitan-Vickers Co. The visitors were received by Dr. Willis Jackson, director of research and education, who was accompanied by other members of the board, and Mr. K. R. Evans, manager, Education Department. The tour concluded with tea in one of the staff canteens.

On 25th June nearly 1,200 employees of **Oldham & Son, Ltd.,** went by two special trains for a day's outing at Blackpool. The luncheon in the Spanish and Baronial Halls was attended by the directors of the company, the deputy Mayor of Blackpool, Councillor Joseph Shepherd Richardson, J.P., and Mrs. Richardson. The chairman of the company, Mr. John Oldham, O.B.E., was prevented from attending the luncheon and Mr. S. J. Wrigglesworth, general manager, read a message from him.

Photograph taken just before the dinner at the British Electrical Power Convention, Brighton (see page 78). Seated: Lady Dalton, Lady Railing, Mrs. Simms. Standing: Sir John Dalton, Sir Harry Railing, Mr. Geoffrey Lloyd (Minister of Fuel & Power), and Ald. Eric Simms

On 23rd June 350 people assembled at the Dorchester Hotel, London, for a reunion dinner to overseas friends of the **General Electric Co., Ltd.** Among those who attended were Sir Harry Railing (chairman and joint managing director), Mr. Leslie Gamage (vice-chairman and joint managing director), and the Hon. Howard Beale, Q.C., the Australian Minister of State for Supply.

Left to right: The Hon. Howard Beale, Q.C., Sir Harry Railing and Mr. Leslie Gamage at the reunion dinner to overseas friends of the G.E.C.

The annual sports meeting of **Johnson & Phillips, Ltd.,** was held at the company's ground at Kidbrooke on 25th June. The scope of the meeting was widened by the inclusion of an inter-club competition, the winners being Cambridge Harriers with Essex Beagles second. The Departmental Shield was retained by the Switchgear Department with the Maintenance Department as runners-up. Prizes were presented by Mrs. W. Glass, wife of the managing director.

OBITUARY

Mr. W. B. Jamieson, manager of the Bradford depot of Falk, Stadelmann & Co., Ltd., died suddenly on 18th June at the age of forty-nine. Mr. Jamieson joined Falks in 1927, and was transferred to the Leeds branch in 1933, subsequently taking over the managership of the Bradford depot when it opened. He leaves a widow and a son.

Mr. J. C. M. Matthews.—The death is reported, on 30th June, of Mr. John Charles Melvin Matthews, formerly chief electrical engineer to the Government of the Malay States. He was eighty years of age.

WILLS

Mr. E. W. Andrews, former managing director of F. Reid Ferens & Co., Ltd., who died on 28th January last, left £3,187 gross (£3,137 net).

Mr. H. Brocklesby, M.I.E.E., chief electrical engineer for No. 5 area, National Coal Board, who died on 20th December last, left £6,853 gross (£6,534 net).

Mr. M. E. F. Crealock, J.P., deputy chairman of Hick, Hargreaves and Co., Ltd., who died on 24th December last, left £24,275 gross (£13,661 net).

Mr. W. V. Green, area manager for British Insulated Callender's Cables, Ltd., who died on 13th December last, left £6,282 gross (£6,056 net).

Mr. J. S. Ramsbottom, head of J. S. Ramsbottom & Co., Ltd., electrical engineers, Keighley, who died on 1st March last, left £33,339.

PRICES OF MATERIALS

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £171 0s 0d
COPPER, H.C. Electro	ton £333 0s 0d
Fire Refined 99·70%	ton £332 0s 0d
Fire Refined 99·50%	ton £331 0s 0d
COPPER Tubes ..	lb 3s 1⅛d
Sheet	ton £391 5s 0d
H.C. wire and strip ..	ton £364 10s 0d
LEAD, English ..	ton £103 5s 0d
Foreign	ton £102 0s 0d
MERCURY	flask £108 0s 0d
TIN, block (English) ..	ton £728 5s 0d
ZINC, G.O.B. Foreign	ton £91 5s 0d
Electrolytic	ton —
BRASS Tubes (solid drawn)	lb 2s 5½d
Sheet	ton £312 10s 0d
Wire	lb 3s 1½d
PHOSPHOR BRONZE Wire	lb 4s 7⅛d
PLATINUM	oz £29 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 38d—38⅛d

WELDING CONFERENCE

The Council of the Institute of Welding has decided to hold a Commonwealth Welding Conference in London in the summer of 1957. The objects of the conference will be to promote an exchange of information on the present technical position of the welding processes and their main applications within the British Commonwealth, and to consider means of improving the exchange of technical information among the countries of the Commonwealth.

It is intended that the conference should be open to all who are interested in welding; invitations to appoint official delegates will be addressed to the welding societies and Government departments of the Dominions and Commonwealth territories. An organizing committee has been appointed under the chairmanship of Mr. A. Robert Jenkins.

C.E.A. LABORATORIES EXTENDED

The new extensions to the Central Electricity Authority's Research Laboratories at Randall's Farm Lane, Leatherhead, were officially opened on Tuesday last by Lord Citrine, chairman of the Authority. These extensions comprise a new wing to the existing building which has enabled the work carried out at the establishment to be rearranged. The extensions were finished and put into operation earlier this year and permit chemical, physical and mechanical problems arising in power stations to be more effectively tackled. A more detailed description of the laboratories and the work which is being conducted in them will be published in our next issue.

Street Lighting Notes

The first stage conversion of street lighting at BOSTON, Lincs, from gas to electricity is estimated to cost £2,979.

ERITH Corporation is seeking loan sanction of £29,841 in connection with a scheme for the relighting of main streets.

ECCLES Corporation is applying for sanction to borrow £11,360 for Class "A" sodium lighting in a number of thoroughfares.

Class "A" lighting of trunk road A.27, from Bursledon Bridge through Park Gate to Segensworth junction, FAREHAM, Hants, is estimated to cost £7,820.

SUNDERLAND Seaside Entertainment Committee is recommending the Town Council to install fluorescent lighting on Seaburn Promenade to replace the existing gas lighting. The cost will be about £2,900.

LOWESTOFT Works Committee has recommended the submission to the Ministry of Transport and Civil Aviation of a scheme for sodium lighting along the whole of the trunk road A.12 within the borough at an estimated gross cost of £13,000. The Committee has accepted the quotation of the Eastern Electricity Board for new street lighting at Kirkley Run, Waveney Road and Battery Green at a cost of £2,562.

LEEDS City Council is recommended to authorize expenditure of £60,000 for the relighting of approximately 20 miles of main roads during the coming year.

Loan sanction of £7,910 has been received by PLYMOUTH City Council for new street lighting in the city centre.

SOUTHAMPTON Corporation is applying for permission to borrow £19,405 for carrying out four street lighting schemes.

Greek Hydro-Electric Project

The Athens correspondent of the *Financial Times* reports that work is to begin at the end of this month on a 230,000 kW hydro-electric development at Megdova. Construction is being undertaken by the French firm of Omnium Lyonnais with a credit of 350 million francs from French banks.

PARLIAMENTARY REPORT

Rating and Valuation Bill

During the later stages of the debate on the Rating and Valuation Bill, Mr. Gerald Nabarro moved an amendment seeking to exclude from the "pool" rating arrangements all premises and hereditaments of the gas and electricity undertakings which were not of a productive character. He said this would remove a widespread grievance. He did not believe that even the most sincere supporters of nationalization believed that a rating advantage should be given to the shops and showrooms of nationalized undertakings over the shops of private business concerns which had to pay rates in full. As an example of the grievances felt by local authorities and traders, he cited the case of a shop at Stourport-on-Severn which, when used by a hairdresser, had a rateable value of £30 and would normally be paying a sum of £40 a year in rates. But since it was taken over by the Midlands Electricity Board as a service centre and a retail shop for electrical appliances and equipment, no rates were paid; it was taken to be covered by the payment to the local council from the pool fund into which the C.E.A. paid a lump sum in lieu of rates for the benefit of local authorities throughout England and Wales. But the council had received no increase in its allocation from the pool.

Mr. Nabarro said it ill became the Government to give an advantage to nationalized undertakings which they were not prepared to give to their private enterprise counterparts.

Referring to the pool payments, he said that according to the C.E.A. report the amount payable in lieu of rates increased from £14·05 million in 1952-53 to £14·76 million in 1953-54. Of this increase of £0·71 million, £0·61 million was due to higher local rates and £0·10 million to the expansion of sales of electricity. That meant that only a £100,000 increase in rates was paid by the whole of nationalized electricity, including both the C.E.A. and all the Area Boards, on £14·05 million. This represented an increase in rates in respect of the expansion of electricity sales of less than 1 per cent for the full year, when sales actually increased by 6·9 per cent.

An equally important point was that one could not separate, in the amount in lieu of rates, the part attributable to the increase in the generation of electricity and the amount attributable to the increase in commercial activities. In respect of showrooms opened in the last three or four years at least, the local authorities in the areas where they were situated had received no increase in the allocation from the pool. It was much too long to wait until 1957 for these grossly inequitable arrangements to be revised.

Mr. Enoch Powell supported the amendment, saying that the mistake was made originally in setting up a pool payments system in respect of premises not directly concerned with the manufacture and distribution of electricity. The pool system was adopted because it was difficult to value for rating purposes those hereditaments, such as electricity lines and gas mains, that extended from one rating area to another. There never was any difficulty, however, about valuing offices, showrooms or other similar premises and there was no reason why these should come within the ambit of the pool system.

Several other members supported Mr. Nabarro's contention that the Inland Revenue should assess these premises and that the rates should be paid locally to the authority in whose area they were situated. Mr. Kenneth Thompson said that not only did a local authority not get a rate income from showrooms; as a rule they found that one or more of its most prominent and highly-rated sites became sterilized for revenue purposes.

Replying for the Government, Mr. W. F. Deedes, Parliamentary Secretary, Ministry of Housing and Local Government, said that he had been impressed by the support given to the amendment. The discussion had clearly indicated the need for a review of the pool payment arrangements and this would begin next year and would be concluded by April, 1957, with any legislative backing which was required. But to cut right across the formula which had been agreed would, at this stage, cause great difficulties and would delay the process of revaluation which everyone was anxious to get through. In view of this, although the Government was sympathetic toward many of the points made, it could not, for practical reasons, accept the amendment.

After further discussion the amendment was negatived.

Battery Rail-Cars

Sir Robert Boothby asked the Minister of Transport and Civil Aviation whether his attention had been drawn to the suggestion in the current report of the Electricity Consultative Council for the North of Scotland that an experiment should be made with battery rail-cars on one or more of the branch lines in the North of Scotland where it had recently been decided to discontinue ordinary passenger trains and whether he would give a general direction to the British Transport Commission to consider this proposal.

Mr. John Boyd-Carpenter said this proposal had been considered very carefully in consultation with the North of Scotland Hydro-Electric Board, and a great deal of detailed investigation undertaken. The Board had decided that it would not be justified, in present circumstances, in going on with this experiment, particularly as the potential running and maintenance costs of battery coaches would make little difference to the economics of branch lines.

Nuclear Power

In reply to Mr. George Strauss, Mr. Birch, Parliamentary Secretary, Ministry of Works, said that the six nuclear reactors recently announced would come into operation before any of the stations in the civil programme because they were exact replicas, rather than improved versions, of the two reactors now under construction at Calder Hall. The output of the six additional reactors would be between 150 MW and 200 MW.

Mr. Strauss said it seemed rather strange that in the original statement the Authority made no mention of this very big further contribution to the supply of electricity.

Mr. Birch: "The statement made in the White Paper concerned power stations put up by the Authority for civil use. These reactors are to produce both fissile material and electricity."

Referring to the financial and technical assistance promised by President Eisenhower to countries that sought United States aid, Mr. Strauss said that unless this country did something similar, or co-operated with other countries in the same way, it would be left very far behind. Could the Minister say whether the Atomic Energy Authority was urgently considering any plans to deal with this very important matter?

Mr. Birch replied that what President Eisenhower had done was to make certain proposals which were to be submitted to Congress in the United States. Nothing positive had happened yet. This matter was very much in our minds, and we had offered fissile material to other countries. We had also trained atomic scientists from other countries, and had offered aid in the erection of atomic reactors in other countries, but it would be appreciated that our resources were not so great as those of the United States.

Electricity in Malaya

Mr. Awbery asked the Colonial Secretary if he was aware that security lighting had been discontinued in many of the villages in Malaya and that the scattered inhabitants of the jungle had been promised many benefits in the

resettled villages, such as electric lighting. He asked if the grid system could be extended to these villages.

Mr. A. T. Lennox-Boyd said that where the grid was available, villagers could have electricity in their houses if sufficient of them were prepared to pay the necessary charges. It was not possible to provide electricity everywhere in the Federation but the new villages would benefit, in common with other rural communities, from future extensions of the grid.

Bricks from P.F. Ash

Mr. Dodds asked the Minister of Works, in view of the successful experiments at the Building Research Station, Garston, Hertfordshire, in producing good quality bricks from pulverized fuel ash and 15 per cent clay, what action had been taken to develop the production of bricks by this method.

Mr. Birch said he could not yet add to the statement he made on 29th March.

Mathematics and Science Graduates

Sir David Eccles, Minister of Education, replying to Mr. Osborne, said that in England and Wales the number of mathematics and science graduates admitted to professional training for teaching or entering maintained schools as untrained teachers was 964 in 1952-53, 917 in 1953-54 and 1,008 in 1954-55. He had no precise information about comparable numbers of graduates entering industry. The number of university first degrees and diplomas in pure science awarded was 5,246 in 1952, 5,211 in 1953 and 4,970 in 1954. The number of mathematics and science graduates in maintained primary and secondary schools increased from 11,022 in March, 1952, to 11,287 in March, 1953, and 11,615 in March, 1954. These increases were very welcome though it was a matter of serious concern that not enough of the more highly qualified graduates had been entering teaching. Moreover during the coming years the schools would need a much larger increase in numbers if staffing standards in science were not to deteriorate.

Oil as Fuel at Power Stations

Mr. Nabarro asked the Minister of Fuel and Power whether he would make a statement on the progress of conversion of coal to oil firing at power stations and dual firing; how much coal would thereby be saved this year and in 1956 and 1957; what steps he had taken to assure adequacy of oil fuel supplies for this programme; and how much extra oil fuel was involved.

Mr. Geoffrey Lloyd said the Central Electricity Authority had recently announced a long-term contract with one oil company and other negotiations were still in progress. Deliveries of oil would begin towards the end of this year and it was hoped that half a million tons of coal would be saved in 1956 and up to 4 million tons in 1957. By 1960 the use of 5 million tons of oil in about 16 power stations should be saving about 8 million tons of coal. He was satisfied that these additional supplies would be available.

Mr. Nabarro asked the Minister to confirm that a number of oil companies tendered for this important contract and that the contract was placed with the lowest tenderer, notwithstanding the fact that it was an American firm. In these circumstances would he confirm that there was no price ring operating among the oil companies?

The Minister replied: "It certainly was evidence of strong competition and the Central Electricity Authority did what they considered was the best business for themselves."

In reply to a further question Mr. Geoffrey Lloyd said he welcomed the opportunity of emphasizing the urgent need of increased fuel efficiency both in industry and elsewhere and the advantage to the nation of increasing the use of oil in place of coal, but he hoped to make a fuller statement on these matters at an early date.

Ministries and Industry

Mr. George Strauss asked the Minister of Supply what steps he took to ascertain the views of the engineering industry before it was decided to transfer his responsibilities for that industry to the President of the Board of Trade.

Mr. Erroll, Parliamentary Secretary, Ministry of Supply, said the former Minister of Supply met and discussed the proposed transfer with a group of some twenty leading industrialists representing a cross-section of the engineering industries, and also with the presidents of the Confederation of Shipbuilding and Engineering Unions and of the Amalgamated Engineering Union.

Mr. George Strauss also asked what was the definition of the light-metal industry which was to remain his responsibility after the other recently announced changes in responsibility had taken place.

Mr. Erroll said that the Ministry of Supply would continue to exercise the responsibilities for aluminium, magnesium and titanium in all stages beyond that of primary metal which it had at present.

Coal Imports

Mr. Victor Yates asked what would be the approximate cost of importing 12 million tons of coal during 1955 as compared with the total cost of coal imports during 1954.

Mr. Geoffrey Lloyd: "Up to about £80 million compared with £17 million last year."

Solar Energy Conference

An international conference on the scientific basis of applied solar energy will be held at the University of Arizona, Tucson, on 31st October and 1st November as a prelude to the World Symposium on Applied Solar Energy to be held in Phœnix from 2nd to 4th November. Both the Tucson and Phœnix meetings will be jointly sponsored by the Association for Applied Solar Energy, the Stanford Research Institute and the University of Arizona.

Scientists from many countries are expected to attend the Tucson conference to exchange ideas on fundamental principles involved in the application of solar energy. They will then move on to Phœnix to discuss the technological aspects of the practical utilization of solar energy with representatives of industry, agriculture, finance and education.

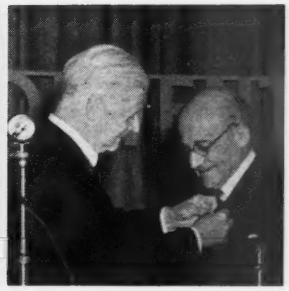
One of the major objectives of the meeting at the University of Arizona will be to assist scientists in charting the direction of future research. The conference will permit free discussion of the scientific basis upon which the utilization of solar energy is founded. Following a general session, three sections will convene to discuss thermal, photochemical and electrical processes for converting the sun's energy to man's use.

Dr. Richard N. Thomas, of Harvard College Observatory, will open the general session in Tucson on the morning of 31st October with a discussion of "The Features of Solar Energy as Imposed by the Physics of the Sun." Dr. Sigmund Fritz of the U.S. Weather Bureau will describe the geographic distribution of solar energy, with special reference to systematic programmes of observation. Dr. Farrington Daniels of the Department of Chemistry, University of Wisconsin, will review the principles and problems of research in the utilization of solar energy.

Three special sessions will be held concurrently on the afternoon of 31st October and the morning of 1st November. Dr. Everett D. Howe, chairman of the Department of Mechanical Engineering and assistant dean of the College of Engineering at the University of California, Berkeley, will serve as chairman of the section on thermal processes.

Co-chairmen of the section on photochemical processes will be Dr. C. S. French and Dr. H. W. Milner of the Stanford, Calif., laboratory of the Carnegie Institution of Washington. In a discussion of large-scale algæ culture, Dr. Milner will lead a session on relevant aspects of algal physiology and Dr. French will be chairman at a session on practical considerations of algæ culture.

Electrical Power Convention



Sir Harry Railing invests Sir John Dalton as the new President and (right) Sir John Dalton presents the Past-President's badge to Sir Harry Railing

Future Electricity Supply

OPENING the discussion on Mr. Eccles' paper on " The Generation of Electricity in Britain," at the British Electrical Power Convention at Brighton, Sir Claude Gibb, F.R.S., D.Sc., emphasized the duty of every executive in industry to drive home the direct relationship between electricity usage and productivity and between productivity and the national living standards. Except where a country had an exceptional abundance or an exceptional shortage of natural resources, he said, living standards as between countries, and between families in any one country, varied directly with electricity consumption. That fact was not fully accepted, however, in Britain by Governments, executives or workpeople and their trades unions. If the reality of the potential improvements in living standards were appreciated by management and men, Mr. Eccles' forecasts would be " shot to pieces " and the load-shedding of past years would be as nothing to that of the future, because shortage of coal for electricity generation would lead to an unending series of crises.

In the works with which Sir Claude was associated, records of electricity maximum demand and unit consumption had been kept for the past fifty years and, plotted on a logarithmic basis, produced an almost perfect straight line and showed a doubling of demand and usage every seven years, with a night load equal to or greater than the day peak; but these records would receive a " horrible kink " in 1956-57, when an extensive re-tooling would be completed. Competition to-day was so severe that a complete revision of existing machine tools and methods had been made. An outstanding example was the replacement of a tool with a 50 h.p. motor drive by one having 480 h.p. built into it with cutting time for a given surface area reduced to nearly one-fifth. Many British machine tool makers, however, were not yet sufficiently electric-power conscious and shuddered at the demands of his firm for more and more power and greater feeds and depths of cut. More power into a machine tool was always a good investment provided the operator used it fully.

Manufacturers and the C.E.A.

Manufacturers had no quarrel with the technical policy of the C.E.A., believing that, for the system load factor and the low-grade coal available in this country, the steam conditions and sizes of unit installed and to be installed had been wisely chosen. Where industry might disagree with the C.E.A. was in the forecast rate of demand growth and the absence of special tariffs which would encourage load factor improvement. The chairman of an outstanding overseas public utility had told Sir Claude that whereas he could talk his way out of having installed an additional unit a little too soon, he could not survive the loss of potential load which would result from the smallest amount of load shedding. Industry would urge the Authority to reconsider tariff rates and methods of building off-peak loads.

Mr. Eccles had stated that all 120 MW reheat units were expected to be capable of operating under two-shift conditions. It was simple to write that demand into a specification, thus " passing the buck " to the manufacturers, but it would be much better to build load factor so that such units would operate continuously and therefore at maximum efficiency and with minimum maintenance.

Nuclear Power Vital to Britain

Any increase in living standards must be dependent on increased electricity consumption, which would not be possible if it was dependent on coal. Nuclear power would be forced upon Britain at a far faster rate than was technically desirable because it was the only source of an alternative fuel to coal which could be purchased within the Commonwealth without calling for hard currency. Sir Christopher Hinton and his staff at the A.E.A. had done wonderful work in translating into engineering the researches of Sir John Cockcroft and his scientists. Their part in the future of the electricity supply industry and the prosperity of the nation would become evident when the failure of the coal industry to meet the demands upon it forced a cessation of the building of coal-fired stations and salvation lay only in nuclear power plants.

In the United States the approach had been on rather different lines, because for military purposes the Americans had created huge plants for the production of concentrated fissile material, and those plants could not be put on a care-and-maintenance basis should peace " break out," and would probably be diverted to some peaceful use. That would give the manufacturers and designers of the United States a tremendous pull over this country.

Sir Claude concluded by saying that he had only one complaint against Mr. Eccles: he was not sufficiently electricity-minded or sufficiently optimistic.

Mr. W. N. C. Clinch (C.E.A.), while proud of the fact that this country was building 200 MW turbines for a pressure of 2,350 lb/sq in, suggested that it would be well to undertake the adventure of going to super-critical pressures, which might permit the efficiency of 37·6 per cent mentioned in the paper to be raised to 43 per cent.

Mr. L. S. Robson (B.E.A.M.A.) said that the ability of the C.E.A. to give firm estimates of required plant capacity for five years ahead, with provisional estimates for the sixth and tentative estimates for the seventh year, had made it possible for the manufacturers to co-operate in producing increased output and in developing the newer types of turbine required, and to secure the co-operation

of the steel makers, without which the latest designs of steam turbine would not have been possible.

The need for turbines to be suitable for two-shift operation emphasized the importance of facility in starting, and here the investigations made jointly by the turbine and boiler makers in 1952-53, with the co-operation of the station authorities, had proved of the greatest value. With unit installations such as were now becoming general the weight of steam piping and associated valves and receivers would be reduced by more than 50 per cent, which would materially simplify the problem of quick starting. Close coupling would also be of value in this connection.

Mr. W. B. Shannon (London Division) suggested that the imposition of a directly conventionally fired plant on the nuclear cycle to add superheat to the steam offered greater gains than a similar fuel expenditure on the "super" conventional steam cycles, with few of the attendant practical complications. So far as the use of the gas turbine in combination with nuclear plant was concerned, the temperatures required to make this worth while were of the order of 650 deg C or more. This combination was dependent on one of the major problems associated with the reactor, the development of some special material to encase the uranium fuel elements so that higher temperatures could be used.

He had been told that the use of liquid sodium, suitably encased, as a coolant was not affected by radioactivity, so that presumably air could be used in conjunction with a liquid sodium reactor. A development which might take place many years hence was to compress air, heat it in the sodium heater and expand it through a gas turbine, eventually discharging it to atmosphere.

Mr. Eccles, replying to the discussion, said that their nuclear power programme might be regarded as the hope of the future. At the moment they could get from one ton of uranium the heat equivalent to that from 10,000 tons of coal, but before his professional life was over he hoped to see one ton of uranium being equivalent to 100,000 tons of coal, and in time it might be equivalent to 1,000,000 tons.

He expressed the appreciation of the C.E.A. of the great technical co-operation which they had had from the manufacturers. Therein lay the hope for the future prosperity of this country.

Careers in the Electrical Industry

THE afternoon session of 29th June was devoted to the presentation and discussion of three papers on the electrical industry as a career.

Sir Henry Self, in presenting his paper on the supply industry, said that a great era of development was opening up, and the object of the careers scheme in the industry was to get boys to realize that they had the chance of a career with unique possibilities and with prospects beyond belief.

The supply industry could claim to have given a lead, particularly in its consultative machinery. It was necessary to have mature people coming into the industry from outside, as a "ginger group," to ensure that current practice outside was translated into the best possible practice in the supply industry, and conversely some people should go from the supply industry to challenge other industries. Sir Henry appealed to manufacturers to respond to the Authority's offer to have complete interchange arrangements for superannuation, so as to make this possible.

Mr. S. E. Goodall, dealing with the manufacturing industry, referred to the proposed scheme for a "sandwich" diploma and said that some people feared that the ultimate aim would be to accept as chartered engineers only those men who went through a technical college in this manner or who had been to a university. That was not true; there was not the slightest intention of closing the door to the man who often did much better work and was a far more able engineer and who came up "the hard way" by part-time education. In the manufacturing industry the technician was the salt of the earth, and it was a grave deficiency in this country that inadequate training had been provided for such men. It was hoped that the new courses which had been designed for them would not only attract new men but help those who were already giving excellent service in this sphere.

Mr. R. A. Marryat presented the third paper, which dealt with prospects in the installation contracting industry and education and training methods.

Mr. A. M. F. Palmer, M.P. (Staff Associations' Committee), who opened the discussion, paid a tribute to Sir Henry Self's work as chairman of the Central Authority's Education and Training Committee. The statutory obligation on the Central Authority and the Boards to consult, on education and training matters, their employees through their trades unions and staff associations was fulfilled both in the letter and in the spirit, so that the employees felt increasing confidence in the industry's educational policy.

The supply industry was most anxious to obtain the best type of graduate. In view of the need for the best technical brains in the manufacturing industry, with its high export potential, it was natural that they should be attracted there. They were not on that account lost to the supply industry, because of the interdependence of every part of the electrical industry. He did not lament the fact that there was competition for the services of technical men; it was likely to have a most stimulating effect on salary levels. The Queen's Speech at the opening of Parliament had contained a hint of new legislation on technical education. The engineering industry as a whole was now much clearer than it had been before on the kind of educational structure that it needed for the creation of engineers and technologists, and it should be possible to fit the framework of the new legislation round the developments which had already taken place.

Mr. E. A. Logan (Southern Electricity Board), commenting on the need to increase the number of student apprentices, said that competition for them from other branches of engineering had to be faced, but this had been useful in focusing attention on the problem at the level of provincial grammar schools. This was beginning to have an effect, and in the next few years the intake would probably be stepped up. He wondered to what extent all the Boards and Divisions were playing their part in providing for the future. Their relative performance in this respect could easily be assessed and those whose efforts were deficient could be reminded of their obligations.

It did not seem possible to fill the top posts in the industry by men working their way up from the bottom to the top in the course of an ordinary working life. If the supply industry failed to adopt some system for the

injection of ability at intermediate levels it would be unique in that respect and lose as a result.

Mr. Logan said he would support any movement which would widen the interests of engineers, but their most pressing task was to provide the environment which would enable future generations to enjoy greater leisure.

Mr. G. M. H. Houston (B.E.A.M.A.) said that it was essential to give every possible aid to the student, taking account not only of his reasoning faculties but of his subconscious creative and intuitive mind. The human mind might be compared to the electronic computer. For the computer one first prepared the material and inserted it into the machine, then allowed the machine to do its work, and finally extracted the answer. In preparing the material for the human mind it was necessary to differentiate between the conscious reasoning faculties and the subconscious mind. It might be that in preparing the material for the subconscious mind the same critical reasoning was necessary, but that had to be examined. Very little was known about the problem of inserting the material, and here also inquiry was necessary.

The third stage was to allow the computer to do the work. With the mind, to dwell on a subject might hinder its working. Finally came the extraction of the answer, and here they should turn to the masters of creative art. He did not suggest that the same type of thinking was required to create a symphony and to " chase amps and volts round a network," but some of these types of thinking should be examined and tried out. The best that one could hope to get from a computer was the right answer, but the human mind was not so limited. At the worst one might get from it a bright idea, and at the best it might open the door to a new and happier world.

Dr. Willis Jackson (B.E.A.M.A.) said that the shortage of young men for training as engineers was not confined to electrical engineering; a recent national inquiry into recruitment to the engineering industry as a whole had revealed a discrepancy of about 30 per cent between the demand for and supply of graduate scientists and technologists. The steps taken inside the universities in the immediate post-war years led by 1950 to more than doubling the pre-war output of scientists and technologists. In 1951 the number of graduate scientists rose to 5,500, which was 2·3 times the 1939 figure, and the number of graduate technologists to over 3,500, which was 2·2 times the pre-war figure.

Unfilled Places in Engineering Schools

Unfortunately the situation since 1951 had not materially improved, and the number of entrants to university courses in engineering had failed to keep pace with the increased facilities made available in the engineering schools. In 1953 there had been 300 unfilled first-year places in the engineering schools, and in the present session there were over 170. In the next three or four years expansion would provide over 1,500 additional places, which meant that over and above the present number of recruits some 600 to 700 boys of university entrance quality would be required.

Similar developments had taken place inside the technical colleges, but here the position was more encouraging, at least in respect of numbers. In 1953 over 7,000 Higher National Certificates had been awarded, which was three times the 1939 figure, and over 12,000 Ordinary National Certificates, or more than six times the 1939 figure, about 2,000 of the former and 3,000 of the latter being in electrical engineering. The sandwich courses should attract boys of outstanding ability from the early years of the National Certificate courses and boys with good records at school and should have a beneficial effect on the recruitment of professional engineers.

Where were the extra boys to come from? The considerable increase in the birth rate round about the end of the last war would mean an increase of about 20 per cent in the 16-18 age group by 1960 and 40 per cent by 1964, but its effect would be small until 1960. Something might be done to keep at school boys capable of taking the G.C.E. at advanced level. A recent inquiry showed that in English grammar schools 2,900 boys capable of taking science and mathematics at advanced level left prematurely. Thirdly, in the sixth forms of grammar schools there were at present 55 per cent on the science side and 45 per cent on the arts side. There seemed little hope of a greater number of outstanding entrants into engineering and science unless this distribution could be altered in favour of science.

Managerial Qualifications

Mr. L. G. Moser (Staff Associations' Committee), referring to Sir Henry Self's statement that the bulk of the managerial appointments in the supply industry called for engineering qualifications, said he had never understood why it was regarded as easy for an engineer to obtain an adequate grasp of accounting and legal matters in an engineering organization but impossible for an accountant to do the same in engineering. It was desirable to have as managers people who were capable of making decisions and determining policy in the light of the technical advice available to them.

Mr. H. W. Swann (B.E.A.M.A.), commenting on Mr. Marryat's paper, agreed that the installation contractor carried not only a technical but a moral responsibility for offering good advice and not seeking to exploit the customer's lack of knowledge. The industry needed the type of man who could tackle architects, housing authorities and Government officials at their own level and inspire the confidence which should exist between men of equal professional status. The other branches of the electrical industry, however, were also competing for such men.

The principal of a technical school had told him that only 20 per cent of those attending evening classes in elementary electrical work obtained the school certificate, but the other 80 per cent were snapped up by local electrical contractors, the point being that the " rate for the job " did not discriminate. It should be recognized that installation work required just as much knowledge, initiative and enterprise as supply or radio work. The young installation engineer should enjoy the same status and be able to look forward to a career with as much confidence as his colleagues in other branches of the electrical industry.

Mr. S. L. M. Barlow (I.E.E.), who also dealt with Mr. Marryat's paper, said that, in spite of the good work done by Mr. Marryat and his father, the installation industry was not doing enough for the technicians and did not have a clearly-enough defined goal for them. Many technicians were afraid to try for the Swann Diploma in case, should they fail, their job might be in jeopardy. Some education in regard to productivity was required, because productivity in the electrical contracting industry to-day was only 65 per cent of what it had been before the war.

All three authors briefly replied, Sir Henry Self pointing out, in reply to Mr. Moser, that the man responsible for running a station had sometimes in an emergency to take decisions in a matter of seconds. Such decisions must be based on his own conviction that he was doing the right thing, and not on advice which he had to take because he did not know the answer. In a basically engineering industry the bulk of the managerial appointments must go to engineers.

British Electrical Power Convention

Electricity and the Industrial Future

THE Convention on Thursday discussed four papers on "Electricity and the Industrial Future," dealing at the morning session with the steel and coal industries. Mr. W. F. Cartwright, in presenting his paper on the steel industry, said that the total use of electricity in that industry in 1953 was 5,110 million kWh, and in 1954 5,364 million. It purchased from the C.E.A. 3,340 million kWh in 1953 and 3,409 million in 1954, which meant that in 1954 it bought 65·4 per cent and generated 34·6 per cent of its requirements. With the gradual modernization of obsolete works and the construction of new ones it was estimated that the proportion generated would fall to 24 per cent in 1960 and still be at about the same level in 1965, but that bought from the C.E.A. would rise to 6,940 million kWh in 1965.

Mr. J. F. Smith (South Wales Electricity Board), who opened the discussion and, as it turned out, proved to be the only speaker, said that Mr. Cartwright admitted that it was illogical for fuel oil or coal to be burnt in the relatively small boilers of the iron and steel industry rather than in the large-scale installations of the C.E.A., but thought that the burning of coal or fuel oil in the iron and steel industry to eliminate peaks in demand would continue. "Peak lopping" could in certain circumstances provide useful economic benefits to the supplier and the supplied, but in the example given in the paper it appeared that the saving in maximum demand of about 13 MW took place between 6 p.m. and 7.30 p.m., when the increased load should have caused no embarrassment to the supply authority.

Widening the "Peak"

There was no need for strict adherence to the off-peak and on-peak hours stipulated in any agreement if in an emergency the Area Board could supply the extra energy without financial loss and without difficulty. It would serve the interests of both the supply industry and the steel industry, and the national interest, to widen the peak-load hours as much as possible. The institution of tele-metering might well be justified so that the parties concerned would know just how they stood from moment to moment.

The President had emphasized the need for co-operation between the supply industry, the electrical manufacturing industry and the steel industry to become increasingly closer. The figures which Mr. Cartwright had given for the probable future demands of the steel industry were of the greatest interest, and if similar figures were available for other industries it would be very helpful to the C.E.A. in making its forecasts. In both the steel and electricity supply industries adequate safety margins against break-down must be provided.

Mr. W. F. Cartwright, in reply, said it would be a good thing for the steel industry to hold discussions with the C.E.A. to make sure that whatever was done was what was most efficient from the point of view of the country as a whole. The steel industry would need to do a certain amount of generation to guard against upsets from without, and he would not like to see generation in the industry fall below a certain minimum, irrespective of the question of maximum demand. Great progress had been made in preventing generators being shaken out by surges on the main grid system, and it was now possible to keep essential services running successfully even when the grid tripped out.

THE COAL INDUSTRY

Mr. B. L. Metcalf then presented his paper on the coal industry, remarking that for at least another fifty years an efficient coal industry would be essential for this country's industrial future; without it, the atomic age would be stillborn. With the staff available it was difficult for the coal industry to do more than two complete major electrifications in a year. He had at one time dreamt of building pithead power stations at all collieries, but the C.E.A. was now prepared to take all the low-grade fuel which the coal mining industry could supply.

More thought should perhaps be given to the economics of washing coal as compared with taking it dry and extracting the dirt in the furnace. It was undesirable to build expensive washery plants if they were not necessary. If by commercial bargaining the price of the low-grade fuel were forced down to too low a level, it might pay the mining industry to modernize some of its existing steam plant.

The Area Electricity Boards were very helpful in the emergencies which were bound to happen, but the mining industry required special consideration. It did not want to be saddled with the expense of putting in diesel engines for an emergency standby supply, but one disaster arising from a failure of supply might mean that they would have to install such standby plant at every pit.

He had been trying for 25 years to electrify collieries, but he sometimes wondered what the result would be if the same effort had been put into improving the efficiency of steam and compressed air plant.

Earlier that week he had attended a conference in Paris at which a number of papers had been given on underground distribution and control gear, and he and his colleagues from the N.C.B. had come to the conclusion that British manufacturers were twenty years ahead of their Continental colleagues in the safety, robustness and general engineering standards of the underground equipment which they provided. The N.C.B. had collected operating data which should assist manufacturers in their designs, and would like to help the electrical manufacturing industry in the export markets by making this information available.

Dealing with the use of electric lighting at the coal face, he mentioned that the use of aluminium had been banned, and a suitable substitute had not yet been found.

Mr. A. R. Cooper (North West, Merseyside and North Wales Division), opening the discussion, expressed his pleasure that Mr. Metcalf had abandoned his dream of building pithead power stations and was handing over to the C.E.A. the nightmare problem of burning the "semi-liquid refuse" which the N.C.B. had available. It was easy for the nationalized industries to develop a certain amount of technical and administrative parochialism, and in many cases there would be more real collaboration between three private industries than between the three nationalized industries. The N.C.B., the Gas Board and the C.E.A. were all carrying out research into gas turbines, and it seemed wrong to have three independent teams for this purpose. In the North West there were fairly regular

meetings between the chief officers of the three industries; they had no "trade secrets" and each learnt what the others were doing, thus avoiding duplication. There was room for much more collaboration and interchange of information on those lines.

Mr. G. F. Peirson (Midlands Electricity Board), on the question of reliability of supply, said that it was usual to provide a ring main supply with an alternative "third string to the bow." The use of v.h.f. communication mentioned by Mr. Metcalf was being increasingly adopted by Area Boards and cut down the duration of interruption very considerably. It would be helpful if Mr. Metcalf could say how long the average colliery could manage without a supply under emergency conditions. The mining industry seemed to regard 6·6 kV as the maximum, but it might well consider using 11 kV; non-draining cables could be provided for that voltage. Polythene insulation might be used on 11 kV cables; it was non-draining, but whether it would come out like candle fat at the bottom he did not know.

Continuity of Supply

Mr. F. J. Lane (C.E.A.), on the question of security of supply, made a plea for close consultation with the supply industry on the design of supply units and the arrangements generally, because much trouble could arise from unsatisfactory protective arrangements and unsuitable layout of the system. There was in the supply industry a wide fund of experience on matters affecting continuity of supply, and if use was made of this it would be of benefit to both sides. Each side had its own particular skill and experience, and it would be to the advantage of both parties if in the design of such large supply units as Mr. Cartwright had illustrated, or the smaller ones envisaged by the Coal Board, there was full collaboration with local people in the supply industry.

Lord Citrine (C.E.A.), speaking as a former member of the Coal Board, said it was too often assumed that it was sheer obscurantism or lack of inventive ability which kept the coal mining industry from rapidly advancing to the stage of modern factory production, but Mr. Metcalf had had a more difficult task in promoting electrification of coal mining than anyone unacquainted with that industry could realize. A continual struggle was going on to make conditions underground resemble as closely as possible modern factory conditions, but work underground was in the nature of things unattractive. Moreover, the coal mining industry was dealing with a wasting asset and the capital costs of development were enormous.

The electrical engineer could help a great deal in what must necessarily be a slow and uphill task. A modern coal cutter necessarily created large quantities of dust, which partially accounted for the deterioration in the quality of the coal. In the paper the proportion of ash in the coal used in collieries was given as 15 per cent, but he constantly had complaints from power stations that their ash percentage was 20 or more, so that a measure of selectivity apparently took place.

It would be a boon to the miner if equipment could be made more portable by the use of modern light alloys; he had been sorry to hear Mr. Metcalf say that aluminium had been banned from the coal face. Coal would remain a basic source of power for at least two generations to come, so that nothing should be done to create the impression that coal mining was a hopelessly antiquated industry.

Mr. J. R. Harding (C.M.A.) commented on the fact that there was apparently only one electric pantograph locomotive installation, and said the author appeared to regard the field for this type of traction as limited compared with that of the battery locomotive. A limiting factor might be headroom for the trolley wires; if so, consideration might be given to other means of feeding, such as were being developed for overhead travelling cranes in shops where bare wires were not permitted.

Mr. C. H. E. Ridpath (I.E.E.) asked whether the ban on aluminium would extend to experiments with aluminium-cored cables.

Mr. Metcalf, in reply, said that the time for which a pit could be left without a power supply depended on pumping and ventilating conditions, amongst others. Diesel-driven emergency mobile winders were now provided in all districts for getting the men out in an emergency and should help considerably in dealing with the problem of failure of supply. A great deal of consideration had been given recently to taking 11 kV underground, but the cost was fantastic compared with 6·6 kV.

Aluminium had been withdrawn from the coal face because of certain incidents which had occurred. A drill with 85 per cent magnesium in the drill casing had touched off some methane. Aluminium casings were then permitted with less than 2 per cent magnesium, but another incident occurred with aluminium pipe and two with aluminium bars in the roof, where there could be pockets of gas. Behind the coal face aluminium was still used, and, because otherwise a drill could not be provided which was light enough for a man to hold, aluminium casings were permitted for drills so long as they contained less than 2 per cent magnesium.

More propaganda for the use of electricity should perhaps be carried out among the workmen, whose co-operation was essential. The trolley installation at Sandhole Colliery was, he believed, the finest in the world, and a great credit to the manufacturers. It was not the headroom but the regulations which restricted the use of trolley locomotives in new mines.

REQUIREMENTS OF THE CHEMICAL INDUSTRY

On the Thursday afternoon the papers by Mr. G. Nonhebel and Mr. Felix Rogers on the chemical and catering industries respectively were presented.

Mr. G. Nonhebel (I.C.I.), in presenting his paper, stressed the need for more intensive research into new methods of increasing the ratio of electricity to low-pressure steam generated from fuel. With the high-pressure boiler and back-pressure turbine not enough electricity was obtained. The development of the gas turbine and waste-heat boiler might be one solution, but it had been very slow in coming. He was afraid, however, that the ideal of the chemical engineer, who was also a fuel economist, of getting a balance and generating all the electricity and all the low-pressure steam required for process purposes, would never be achieved, because many chemical processes required much power but little low-pressure steam.

Improvements in design and reductions in the cost of electrical equipment meant cheaper chemical manufacture and greater ability to compete in foreign markets, whilst extension of electrification meant lower labour costs, particularly with the extension of automatic control.

Mr. W. A. Gallon (South Wales Electricity Board), opening the discussion, said that in the chemical factory there were three types of problem. There were the problems which arose because of the hazards to which the personnel were subjected. These were solved on economic principles. Secondly, there were the problems of providing protection for the plant and equipment. One of these was to ensure continuity of supply. The usual reply given to consumers who demanded this was that if the normal arrangements made by the Area Board were

insufficient, the consumer must provide a solution at his own expense. For chemical factories that might be done by diesel generators or by a central power station supplying an emergency network. Mr. Nonhebel had referred to the standardization of pass-out turbines and terminal conditions. Chemists, however, insisted on specifying the conditions to which the engineer must work, and would not alter a process to satisfy the requirements of the engineer.

The third type of problem related to methods of control, and there the collaboration of the chemist in stating his wants, the electrical engineer in providing for them, and the electronics engineer would eventually provide satisfactory solutions.

Major H. E. Knight (East Midlands C.C.) said that the manufacturer had gone to tremendous trouble to standardize motors and control gear, but the user could do much more to help to bring it about. With regard to ventilation of motors, in difficult positions he preferred the heat exchanger type of motor with comparatively pure air blown from an outside source. For portable tools he would recommend a 110 V system, with the centre point earthed, giving a maximum of 55 V to earth. He did not favour earth leakage protection for portable tools or hand lamps; all portable tools should be brought in weekly for inspection and maintenance.

Mr. G. M. H. Houston (B.E.A.M.A.), dealing with motor control gear and referring particularly to the contactor type, said that in America at the present time there might be up to 250 motors on one machine, so that reliability was inconsistent with simplicity. Ease of maintenance was often insisted on, but there was a danger of achieving it at the cost of reliability. He emphasized Mr. Nonhebel's plea for early co-operation between the electrical engineer and the designer of plant.

Flameproof Equipment

Dr. S. Whitehead (E.R.A.), confining his remarks to Section 14 of the paper and referring to flameproofness and intrinsic safety, said that research and certification for this gear had been started a long time ago by the Safety in Mines Research Board, while to-day safety in coal mining was a statutory responsibility of the Ministry of Fuel and Power. The E.R.A. co-operated to enable the makers of equipment for hazardous atmospheres to have the advantage of a standard and certificate of world-wide acceptance, and the basis had been broadened and was no longer confined to coal mining. The scale had been modest but the results satisfactory. Development had now caught up with research, which meant that new questions had arisen. The great developments in the chemical and oil industries raised new problems. To carry out all the necessary research would require at least a fourfold expansion of the staffs of the Ministry and the E.R.A., and it was hoped to finance this by contributions from the Government, manufacturers and users. The technical co-operation of the user industries was most encouraging.

The President drew attention to the fact that in five years the consumption of electricity in the chemical industry had increased by 65 per cent; he saw no reason why it should not continue at this rate.

Mr. Nonhebel, in reply, said that if a standard article was available many users would accept it, but if there was no standard they tended to insist on getting their exact requirements. He did not regard it as sufficient to bring portable equipment in for inspection once a week. It received very rough usage from men who did not understand the dangers involved, and might need overhaul five minutes after being brought into service, so that it should be intrinsically safe.

ELECTRICITY IN CATERING

Mr. Felix Rogers then presented, on behalf of the Commercial Electrical Catering Apparatus Section of the B.E.A.M.A., his paper on the use of electricity in the catering industry.

Mr. James Gogan (chief commercial officer, South of Scotland Electricity Board) said that the industry should secure a large share of the £10 million spent each year on catering equipment. One difficulty was tariffs; to a non-engineering consumer, tariffs associated with maximum demand charges or installed load were unnecessarily complicated and a deterrent to development. The South of Scotland Board had realized this and produced a flat-rate catering tariff not tied to connected load or demand which had proved most valuable. The Board also encouraged off-peak heating loads and co-operated with the Scottish Hotel School and the College of Domestic Science.

Manufacturers should advertise in the catering journals, which they did not seem to be doing at present, and there should be constant co-operation between Boards and manufacturers to obtain this business, including the proper display of equipment in showrooms.

Off-Peak Load

Mr. C. W. S. Williams (South Western C.C.), who after 14 years in the electrical industry was now a hotelier, said that there was a good potential off-peak load in the hotel industry in dish-washing, thermal storage, heating, floodlighting and so on, but the caterer would not become electrically-minded unless a tariff was produced which he could understand.

Miss M. V. Griffith (E.R.A.) said that Mr. Rogers had only envisaged the peaceful co-existence of the considerable heating and cooling loads which must often occur together in the catering industry, but the proper exploitation of the heat pump would result in mutual co-operation between these loads.

Mr. W. Gilchrist (Merseyside and North Wales Electricity Board) said that for premises using a great deal of lighting the tariffs might be satisfactory, because the consumer would come on the lower rate for cooking and so on, but in other cases that did not apply. For schools no form of block tariff would be suitable, because they could not absorb the high-priced units for lighting during the summer. All these matters were under consideration, however, and no doubt a satisfactory tariff structure would be found for caterers.

It was very important to ensure that all new commercial buildings were completely electric. The first thing to sell was heating, because that would bring with it water heating and cooking. Architects should be approached and shown what could be done.

There was a vast field in ventilation. He appealed to refrigerator manufacturers to use water cooling for large refrigerators, stepping up the temperature even to 90 deg F. The pre-heated water could then be passed to electric water heaters.

It was not correct to say that maximum demand tariffs involved no difficulty. He knew of a large factory making electrical equipment which used gas in its canteen, because the maximum demand came on top of the normal factory peak. The mains were not always adequate to carry the desired load. The Boards at present had no opportunity to discuss designs and prototype models with the manufacturers of commercial kitchen equipment, and saw them for the first time in exhibitions.

Brief replies to the discussion were made by three manufacturers' representatives, Messrs. L. H. Carmalt (Simplex Electric Co.), A. L. Mitchell (G.E.C.), and H. K. Tomkins (Jackson Electric Stove Co.).

The panel at the "Electrical Forum": Messrs. A. M. F. Palmer, C. R. King and J. Eccles; the President, Sir Harry Railing; and Sir Claude Gibb, Col. B. H. Leeson and Mr. J. R. Beard

Electrical Forum

AT the last session of the Convention, as has become customary, there was a "forum" at which questions submitted by delegates were answered by a panel which had not seen them beforehand. The panel on this occasion consisted of Mr. J. R. Beard, Mr. J. Eccles, Sir Claude Gibb, Mr. C. R. King, Colonel B. H. Leeson and Mr. A. M. F. Palmer, M.P., with the President as "question master."

The first question was whether Area Boards should take "common business risks" and reduce the restricted hours of supply to encourage off-peak load development, and whether the C.E.A. should aid them by establishing a differential between the basic "unit" charges for day and night generation. Mr. Eccles agreed that Area Boards should take ordinary commercial risks, but said that the margin between day and night costs for the C.E.A. was only about 0·06d, which would be too small to be an incentive. By keeping the running unit charge to a minimum the Central Authority helped the Area Boards to develop off-peak loads. Sir Claude Gibb said that it was important to build load factor by off-peak night loads, particularly of the thermal storage type, in that way raising the load factor from 50 to the 70 per cent or more found in North America.

Mr. King agreed with both the previous speakers and regretted the tendency since nationalization not to take business risks. There was a tendency for the kilowatt charge to go up and the unit charge to go down, and this would be accentuated as more new plant was commissioned. If that was to happen in the future, Area Boards should take the risk of lowering unit charges now for off-peak loads to attract the business.

Mr. Beard also agreed, particularly as the nuclear stations must run at a high load factor. Risks should therefore be taken now so as to meet the position which would arise in ten years' time. Mr. Palmer regretted that progress in this matter had been so slow and that there was a tendency to carry over into the post-war world tariff structures which had been appropriate in the very different conditions of the 'thirties. Action should be taken quickly. Colonel Leeson suggested that any risks should be shared between the Area Boards and the C.E.A.

Size of Generating Sets

Another question was what would be the practical limit of size of generating units for two-shift operation during the next ten years. Sir Claude Gibb saw no difficulty with cross-compound machines in going to 350 MW; with in-line machines 250 MW was probably the present limit, but in ten years from now it would probably be 300 MW. Mr. Eccles pointed out that it was difficult to say what the limit would be ten years hence, because in the last ten years so many limits had been overstepped. He was glad to hear Sir Claude suggest that 250 or even 300 MW would be practicable for the "donkey work" of stopping and starting every day, because that was what the C.E.A. would want if the nuclear stations had to be run on base load. Mr. Beard emphasized the danger of going for mere size.

Freedom in Advertising

The next three questions dealt with the desirability of less restraint in advertising and with the need to sell electricity, and were taken together. Mr. King said that the restraint in advertising in relation to the gas industry had been imposed by the Minister, but had virtually been removed twelve months ago. Discussions were still taking place with the gas industry on the question of restraint, and he thought some arrangement of that kind was essential. He welcomed the fact that it had again become necessary to sell electricity, and thought the proper way to do it was by trained salesmen who would go out and sell the product. E.D.A. had now stepped up its advertising project and made it more positive. Some caution was necessary if there was any risk of load cuts in the future.

Colonel Leeson said that advertising had its place as a preparatory measure, but the final attack on the customer must be made by personal contact and by having a good product to sell. Mr. Palmer did not subscribe to the theory that publicly-owned industries should not advertise; reasonable competition between them was good for them and for the country generally. They should be cautious in reaching agreements with the gas industry on restraint in advertising. What would sell electricity was a positive belief in it. He would like to have the house of every member of the Area Boards and of the Central Authority searched and if a gas appliance was found in it he should be drummed out of the industry.

Sir Claude Gibb described advertising as the lazy man's way of selling electricity. The domestic load would not be increased until standards of living increased, and that could come about only by the much greater use of electricity in industry.

Mr. King, commenting on this, pointed out that agriculture was still the greatest industry in the country and much could be done by more rural electrification. Mr. Eccles said that every member of the staff who had influence on others should act as an ambassador for the sale of electricity, and the best way to do that was to use it copiously themselves. Mr. Beard said that he would like to hear more of the all-electric house, but they had to be clear that it was an economic proposition.

Whilst recognizing that electric battery vehicles were not suitable for all electricity supply transport work, the

next question asked whether Boards and Divisions could not use larger numbers of them. Mr. King replied that most Area Boards had tried battery vehicles, but many had discarded them as unsuitable. The petrol vehicle had a longer life and required less maintenance. They were satisfactory for delivering milk, and many co-operative societies had large fleets of them, but they were not suitable for meter readers, who had to cover many miles in a day.

Col. Leeson called attention to the fact that at one university fundamental research was going on into a better way of storing electricity. Not much attention had been paid to this hitherto, but a very drastic development of the battery was required. Mr. Palmer agreed, and said that if some other way of storing electricity could be found which was physically more compact it would revolutionize the position.

Mr. Eccles suggested that the limitations of the battery vehicle were its low speed, size (usually under 1 ton) and range. It was suitable for milk rounds and bread delivery, and Boards might use it more in urban areas, but in rural areas it presented a difficult problem. Looking far into the future, it was known that by allowing hydrogen and oxygen to combine electricity was produced, and a fuel cell was being developed along those lines. When petrol ceased to be available, vehicles might be developed with two cylinders containing oxygen and hydrogen under high pressure which would be translated into electricity in the fuel cell.

Value of Consultative Councils

The next question was whether Consultative Councils were of real value to consumers and whether they should be given more executive authority or abolished. Mr. King thought that the Councils were now working satisfactorily. It would be a mistake to give them executive functions, but in the near future they should come to play an active part in the industry. Sir Claude Gibb said that responsibility must be vested in the Area Boards, which did the day-to-day administrative work. In a democracy it was necessary to have such bodies as Councils, but their function must be purely advisory.

Mr. Palmer said that the consultative machinery for consumers was one of the weakest features of the 1947 Act. Obviously advisory bodies could not be given executive functions, but he would like to see in future more direct representation of the consumers of an area on the Area Board, appointed by local authorities or in some other way.

Colonel Leeson favoured the abolition of the Councils, seeing no purpose in an intermediary between seller and buyer. Mr. Beard said that the fact that the chairman of the Consultative Council was a member of the Area Board gave the Council a certain amount of executive authority. Mr. Eccles wondered whether executive authority was necessary in order to exercise influence. A Consultative Council, if it did not get satisfaction from its Area Board, could make representations to the Central Authority, and if necessary to the Minister.

Insufficient Socket-Outlets

The next question referred to the difficulties due to insufficient socket-outlets and asked how local authorities and private builders could be persuaded to carry out the recommendations in Post-War Building Studies No. 11, which laid down minima. Mr. King said he knew from bitter experience that it was difficult to get a local authority to put in even the minimum number of sockets.

Mr. Beard said he had been chairman of the committee which produced the report referred to in the question. They had managed with a good deal of difficulty to get agreement on a standard 13 A plug and socket which seemed to be coming into increasing use, though not so rapidly as he would like. He deprecated the cheeseparing attitude which sought to save a pound at the expense of considerable future benefit.

Mr. Eccles pointed out that the wiring of the house must be adequate for the number of sockets provided. The lack of public interest in the question was lamentable. Contractors should try to persuade their clients to have modern standard plugs and adequate wiring. Local Councils should be persuaded that electricity was the coming thing and that in the next generation or so it would be the only form of power available to housewives.

The President emphasized the importance of influencing architects and of pointing out that what might be cheapest at the beginning would not be so in the end.

Two other questions were answered by the panel. One concerned the efficiency of boilers, which the panel agreed were already very efficient, and the other asked what could be done to retain the confidence of staff in their personal future. Here Mr. Palmer's view that employees who were up to their job need have little doubt about their security commanded general agreement.

Power Station Construction "Bottlenecks"

The final question was what were the most probable "bottlenecks" in power station construction over the next decade. Mr. Eccles replied that construction on site might prove the limiting factor. With full employment in the structural engineering industry there was no margin of man-power to draw upon, so that great efforts would be needed to effect economies in labour by mechanization. Sir Claude Gibb agreed that man-power shortage would be the main difficulty, but Mr. King called attention to the delays due to planning and the consents which had to be obtained and the objections raised whenever a site was suggested. Mr. Palmer suggested that the industry should approach the Government to simplify the procedure for obtaining the necessary consents. Mr. Beard pointed out that before the war the easier sites had been chosen, but the position was becoming more difficult. Col. Leeson remarked that as generating sets increased in size so the problem of transporting the equipment became more difficult. Until our roads were improved that difficulty would remain.

Sir John Hacking, in proposing a vote of thanks to the panel, referred to the discussion on load factor and said that their main purpose must be to sell the maximum number of kWh per kilowatt, and the best way to do this was to have a relatively high kilowatt charge and a relatively low kWh charge.

Annual Dinner

The annual dinner was held at the Corn Exchange on 30th June, with Sir Harry Railing, President, in the chair, and was attended by some 850 members and guests.

The chief guest was the Rt. Hon. Geoffrey Lloyd, Minister of Fuel and Power, who, in proposing the toast of "The Electrical Industry," said that it was one of the most dynamic and successful industries in the world. Only one or two others could begin to compare with its wonderful success and its marvellous prospects for the future. Its very success, however, raised the problem of how to secure fuel for the tremendous increase in plant which would be necessary if it was to meet the needs of general industry for power. There was no doubt that for the remainder of this century coal must be the basic fuel

for the supply industry. It would be quite unrealistic to think of oil and nuclear power as immediate substitutes for coal.

It was very satisfactory that recently a contract had been signed by the C.E.A. and a great oil company which in the course of ten years would save some 40 million tons of coal. Beyond oil lay atomic energy, and Mr. Lloyd congratulated Lord Citrine and the C.E.A. on the energetic and immediate response which they had made to the Government's invitation to them to take a great part in the first national nuclear power programme in the world. He would also like to congratulate them on the successful start which they had made in partnership with the Atomic Energy Authority. The Government was determined to see that in one way or another during the next five years the industry had all the fuel it needed to keep it going and to meet any expansion in electricity supply which might be required.

The President, in his response, said that it was a great responsibility to speak for an industry employing nearly a million workers and providing electric power for every man and woman in the country, a tool without which no industry could live and no household could function, and which contributed about £220 million of exports to help to pay for the country's raw materials and food.

The Chancellor of the Exchequer had set the goal of doubling the standard of living of our people during the next 25 years. That goal could be reached only if the electrical industry could supply the power which would be required, and he therefore appealed for the co-operation of everyone in removing certain prejudices and obstacles which stood in the way of doing so.

As engineers, their first request was that the policy of keeping the industry out of party politics should be continued in the future. Continuity of policy was necessary for every industry, and above all for the electrical industry, which was essential to every other industry in the country. Secondly, he would appeal to the community to rid itself of generalizations, of half-truths and of labels. Engineers knew the infinite variety which existed in nature and the danger of over-simplification. For example, the public often spoke of the necessity of producing only in the largest units, and also of the need for decentralization. That was no new discovery, as was shown by the relations between the Central Authority and the Area Boards, while the E.R.A. recognized the need for co-operative research on the one hand and for research by private firms and research establishments on the other. There was no universal answer; each case must be decided on its merits. Referring to the subject of monopolies, Sir Harry remarked that the criterion was whether or not in the end, overall and not in detail, an organization rendered good service to the country.

Industry suffered also from the suggestion of conflict implicit in the use of the terms "capital and labour," "employers and workers," a duality which carried the implication that there was a diversity of purpose and of aims. Nothing could be further from the truth. The national conservatism and tradition must not lead us to brood on old troubles and old mistakes. This was a dynamic time, a time full of opportunities which must be taken. We must think of the problems which we had to meet together, and not exaggerate the small differences which must always exist in any community.

Whenever progress was made, those who had contributed to that progress must be allowed to participate in the success achieved according to the measure of their contribution. When, as had happened in the past, undue advantages were obtained by those who had not deserved them, it could be only at the expense of the deserving.

During the Convention they had tried to picture the future and had shown how electrical power would replace or assist the physical power of man and also that it would replace certain brain functions and make our brains available for higher purposes. But this would not take place unless the electrical machines were fed with the right facts, and unless we asked them the right questions we should not get the right answers. That applied also to the human brain to-day.

The electrical industry would do its best to help the community by producing electricity in abundance and as cheaply as possible, and by producing capital goods and consumer goods for our people and for the world. Prosperity was indivisible and the extent of the co-operation of all who worked would decide whether we were to have a richer or a poorer life.

The toast of the guests was proposed by Mr. J. R. Beard, the immediate Past-President of the Convention, who congratulated Mr. Geoffrey Lloyd on being at this critical time in charge of three of the great nationalized industries on which the prosperity of this country depended. One of them was an ancient industry and perhaps showing signs of age; another was mature, but still hale and hearty; the third, electricity supply, was scarcely more than a "teen-ager" and full of enthusiasm in contemplating the almost limitless future before it. Nothing had done more to increase Great Britain's prestige overseas than the ten-year programme of nuclear power development.

Mr. Beard also referred with appreciation to the presence of representatives of some twenty countries who were attending the meeting of the International Electrotechnical Commission in London, who had come to Brighton to attend the dinner.

In the unavoidable absence of the Mayor of Brighton, who was to have replied, the toast was responded to by Alderman Eric Simms, who was Mayor when last the Convention met in Brighton (in 1951) and is a member of the South Eastern Electricity Board.

Annual General Meeting

The annual general meeting of the Convention was held on 1st July. The report and accounts were adopted, the nominations for the Council for the ensuing year reported and certain minor amendments in the rules agreed to.

Sir Harry Railing submitted the Council's nomination of Sir John Dalton as President for the ensuing year. Sir John, he said, had served the country as a soldier and afterwards in the supply industry. He had acted as a regional controller for fuel and power in the last war, and then entered the manufacturing industry. No man was better suited to be President of the Convention.

The election was ratified by acclamation, and Sir John Dalton, after being invested with the President's badge, said that the best way in which he could show his appreciation was by trying to achieve the success that Sir Harry Railing and his distinguished predecessors had achieved for the Convention. He hoped he would receive the same generous assistance as had been accorded to previous Presidents. Sir John then invested Sir Harry Railing with the Past-President's badge.

Sir Harry Railing then submitted the Council's nomination of Mr. J. Eccles as vice-president for the ensuing year; this too was ratified by acclamation, and Mr. Eccles briefly acknowledged the honour done to him.

Sir Harry Railing announced that the Council had accepted an invitation from Torquay to hold the next Convention there from 24th to 29th May, 1956. On behalf of the Convention, he thanked the Mayor and Corporation

of Brighton, the Town Clerk and his staff, Mr. Norman Elliott, chairman of the South Eastern Board, Mr. Steward, the chairman of the Exhibition Committee, and the members of that Committee, and the E.D.A., and in particular Mr. Dale and his staff, for organizing the Exhibition and the publicity for the Convention, and all the others who had helped to make the Convention a success.

Sir Henry Self, in proposing a vote of thanks to the retiring President, said he had been amazed at the versatility, tenacity, vigour and determination with which Sir Harry Railing, with the help of Lady Railing, had conducted the proceedings of what had been a most noteworthy Convention.

Sir Harry Railing, in reply, said it would have been impossible to carry on the work of the Convention without the co-operation, guidance and hard work of Mr. J. W. Simpson and his staff.

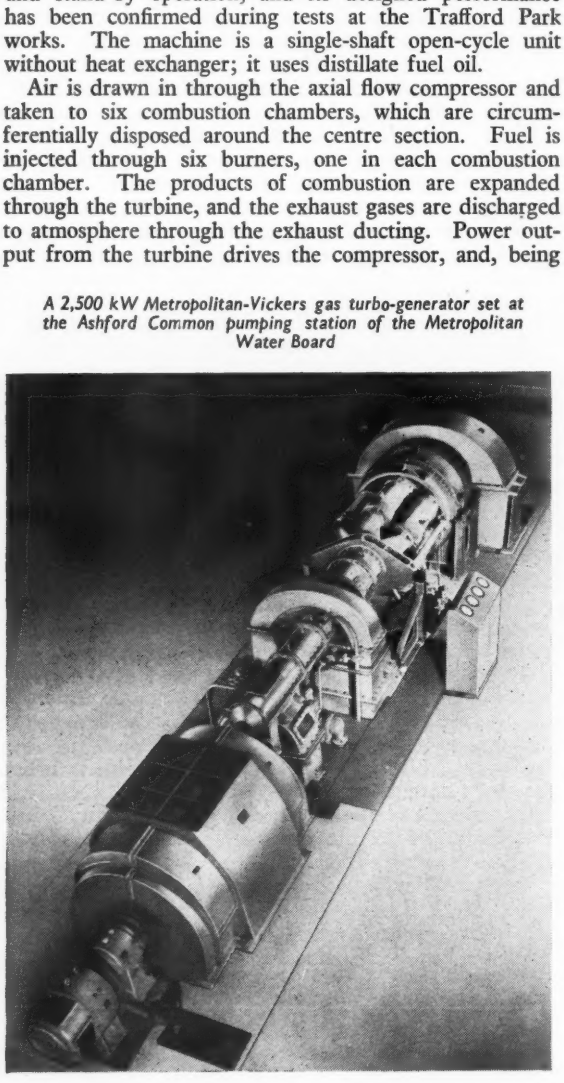
Industrial Gas Turbine-Generator

2,500 *kW Set for the Metropolitan Water Board*

A GOOD example of a gas turbine-generator installation is the 2,500 kW set supplied to the Metropolitan Water Board and erected in the Board's pumping station at Ashford Common, near Sunbury-on-Thames, Middlesex. This set, which has been supplied by the Metropolitan-Vickers Electrical Co., Ltd., will be used for peak-load and stand-by operation, and its designed performance has been confirmed during tests at the Trafford Park works. The machine is a single-shaft open-cycle unit without heat exchanger; it uses distillate fuel oil.

Air is drawn in through the axial flow compressor and taken to six combustion chambers, which are circumferentially disposed around the centre section. Fuel is injected through six burners, one in each combustion chamber. The products of combustion are expanded through the turbine, and the exhaust gases are discharged to atmosphere through the exhaust ducting. Power output from the turbine drives the compressor, and, being greater than the power absorbed by the compressor, also drives the generator through a speed reducing gearbox. A starter motor is situated at the turbine outlet end of the set and coupled to the shaft through a hand-operated clutch. The compressor has fifteen stages with a design pressure ratio of 5·38 at 7,000 r.p.m. and an air mass flow of 60·8 lb/sec.

A 2,500 kW Metropolitan-Vickers gas turbo-generator set at the Ashford Common pumping station of the Metropolitan Water Board



A four-stage turbine is directly coupled to the compressor and drives the generator through a single-helical single reduction gear. The turbine speed is 7,000 r.p.m. and that of the generator is 1,500 r.p.m. The rotor is made from austenitic steel forgings welded together, and it has integral coupling flanges. The cylinder is in two parts, consisting of an outer cylinder which is the main structural member and an inner cylinder which carries the fixed blade diaphragms. The outer cylinder is lagged internally, while the inner one is surrounded by a cooling air space to maintain low outer cylinder temperature. The turbine exhaust consists of a mild steel fabricated casing to take the exhaust gas below floor level.

As the six flame-tube type chambers are disposed circumferentially round the engine between the compressor and the turbine there is a straight through passage for the air and gas streams, and in conjunction with the design of the inlet and outlet branches this results in the minimum loss of pressure head.

Fuel is supplied from an overhead tank through two filters to the electrically driven Towler fuel pump. High pressure fuel, kept constant at 1,000 lb/sq in through a relief valve spilling back to the tank, is supplied to the trip valve which is held open by the main bearing oil pressure. When the oil pressure falls below 2 lb/sq in the trip valve closes, shutting off the supply of fuel to the burners. From the trip valve there is a supply of high pressure fuel to the starting valve, a branch being taken through timing orifices to the servo system of the starting valve. The main fuel through the starting valve is metered to give a progressively increasing supply of fuel during the starting cycle. Before the starting valve there is also a high pressure supply to the servo piston of the fuel isolating valve.

The a.c. generator driven by the gas turbine (through gearing) is rated at 3,280 kVA 0·8 p.f. three-phase 50 c/s 3,465 V and runs at 1,500 r.p.m.

It is of the standard M-V salient pole type with a solid pole rotor and the field winding of copper strap wound on edge. The stator yoke is of welded steel, and the stator winding of the involute type; it is air ventilated with enclosed air inlets and an open outlet at the top of the stator. Excitation is provided from a direct connected exciter having the armature overhung from the generator shaft.

Switchgear Developments

New J. & P. Oil Immersed Switch and Circuit-Breaker

CONSEQUENT on the proposed new British Standard for oil switches on systems up to 33 kV, requiring these to be capable of making a circuit in oil under conditions of short circuit and breaking it under normal conditions, Johnson & Phillips, Ltd., of Charlton, have introduced an entirely new design of oil switch known as type YP.

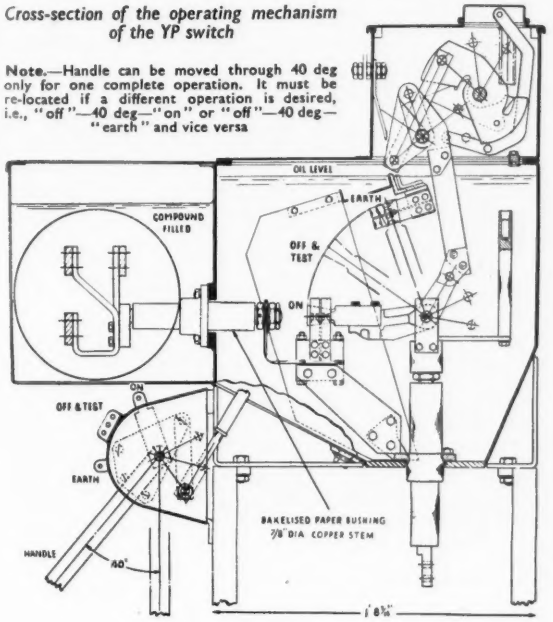
This is a compactly designed unit, the centres of which can be arranged so that they are identical with those of associated metalclad circuit-breakers, rendering later replacement by the latter a straightforward matter. The switch has been designed for voltages up to 11 kV with a normal rated current of 400 A and for system fault capacities of 75 MVA at 3·3 kV, 150 MVA at 6·6 kV and 250 MVA at 11 kV. It conforms strictly with the draft standard and the required type tests have been successfully proved, including breaking tests at 30 and 130 per cent of normal current; and making tests at 33,400 peak amps, at 11 kV on the main busbar contacts and at 11 kV on the internal earthing contacts.

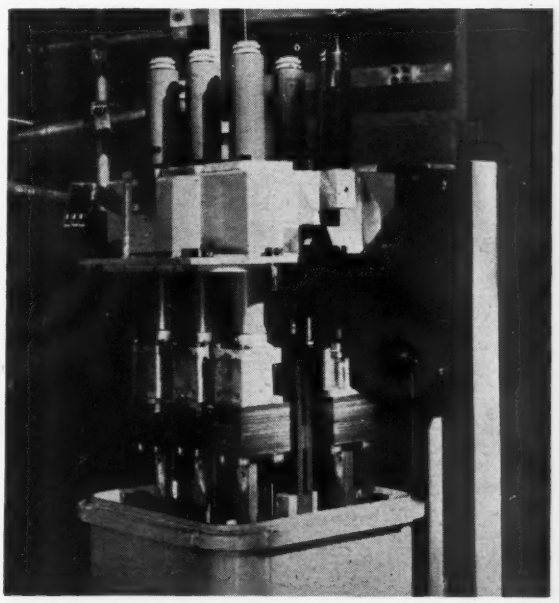
The switch is of single-break design, available with air insulated or compound filled busbars, and is essentially a "two position" one, i.e., "on" to "off" or "off" to "earth." Its operating mechanism is so arranged that it is not possible to pass from the "on" position through to "earth," or vice versa, with one movement of the operating handle. The operating handle must first be in the position for the operation of the switch from "on" to "off." It must then be repositioned before the switch can be moved from "off" to "earth."

A device provided for testing the mains cable consists of three plugs mounted together on an insulating support plate carrying also two interlock posts which prevent the testing device from being withdrawn unless the oil switch is in the "earth" position. They also lock the switch mechanism so that it can be operated only from "earth" to "off."

The main body of the switch is of fabricated sheet steel, the high pressure line contacts are of the wedge and finger

Cross-section of the operating mechanism of the YP switch


Note.—Handle can be moved through 40 deg only for one complete operation. It must be re-located if a different operation is desired, i.e., "off"—40 deg—"on" or "off"—40 deg—"earth" and vice versa
OIL LEVEL
EARTH
COMPOUND FILLED
OFF & TEST
ON
OFF & TEST
ON
EARTH
HANDLE
40°
BAKELISED PAPER BUSHING
7/8" DIA COPPER STEM



Type DB 20 circuit-breaker carriage with tank lowered

type and the moving blades are of hard-drawn bar section copper, profiled so that contact is made simultaneously on all four of the fixed contact fingers.

The company has also introduced the type DB 20 oil circuit-breaker which is intended to combine economy of space with high breaking capacity. It has been developed from the "Trinal" range of breakers, and is of a vertical isolation pattern designed for use with the type AG 20 air-insulated or FG 20 compound-filled metalclad switchgear.

The new circuit-breaker is available for current ratings of 800, 1,200 and 1,600 A in plain break or arc-controlled design. It has been successfully short circuit tested for rupturing capacities of 150 MVA at 3·3 and 6·6 kV in the plain break design; and in the arc controlled design for 250 MVA and 350 MVA on either 6·6 kV or 11 kV and for 500 MVA at 11 kV. For the latter rating in particular it would appear to be a highly compact design.

In the plain break type fixed contacts are arranged in multiple pairs according to the current rating. Contacts are of the high pressure line wedge and finger type, with easily replaceable arcing tips and fingers. The arc control breakers use the well-known cross jet system. For use on the 1,200 and 1,600 A ratings additional shunt contacts are fitted externally to the arc control device but these are used purely for current carrying, the making and breaking duty being performed entirely by the contacts inside the device itself.

During the tests one of these units successfully carried a current of 30,600 A (r.m.s.) for a period of 3 sec, at the end of which the contacts were undamaged and the breaker could be tripped normally.

The circuit-breaker is of welded steel plate contruction. Up to 800 A rating, the top plate is of mild steel with non-magnetic inserts whilst for the two higher ratings most of the top plate assembly has been produced from non-magnetic material. Spring or solenoid closing mechanisms can be fitted.

Restrictive Trade Agreements

Monopolies Commission's Report

IN a report published last week* the Monopolies Commission sets out the conclusions reached by a group of ten members on the general effect on the public interest of collective discrimination, such as exclusive dealing, collective boycott, aggregated rebates and other discriminatory trade practices. The desirability or otherwise of the collective agreement of common prices, which many of the "specified practices" are used to support, was not within the inquiry's terms of reference, nor was resale price maintenance practised by individual manufacturers.

The various types of agreements that were examined are divided into six broad categories, as follows:—

(1) Collective discrimination by sellers (without any corresponding obligation on the buyers); (2) collective discrimination by sellers in return for exclusive buying; (3) collective adoption by sellers of a policy of maintaining resale prices or imposing other collateral obligations on the buyers; (4) collective discrimination by sellers to enforce resale prices or other contract terms; (5) collective discrimination by buyers (without any corresponding obligation on the sellers); and (6) aggregated rebates.

Evidence Considered

The report discusses each category in turn, with illustrations from earlier reports, including those on electric lamps and insulated electric wires and cables. Some of the trades covered in these reports abandoned practices following recommendations contained in the reports, and these were asked to indicate what the effect of the changes had been. The group also undertook extensive investigations of its own among 290 associations of traders and similar bodies from whom 164 statements were received; these included 23 associations in the electrical engineering industry, which furnished 16 statements. About 90 statements were received from individuals and concerns complaining about the effect of specified practices in various trades. Most were about exclusion from an approved list or from some other benefits of an agreement in a particular trade. These often reflected disagreement over whether an individual or concern possessed the requisite qualifications.

A chapter of the report deals with policy in other countries, mention being made of the Sherman Act of 1890 which declares illegal in the United States "all contracts, combinations or conspiracies in restraint of trade or commerce among the several States or with foreign countries"; the Canadian anti-trust law which is essentially part of the criminal law; and the system of registration of restrictive agreements introduced in Sweden in 1946.

Seven members of the group are of the opinion that the practices referred to adversely affect the public interest and should, with certain exceptions, be generally prohibited. The other three members disagree, contending that the evidence does not justify so sweeping a condemnation.

In a summary of their general findings and recommendations, the majority say that they have been impressed particularly by the effect of a binding and collective obligation in preventing traders from experimenting and from trying out new or different ways of conducting their business. The collective selection of favoured traders for exclusive selling or buying or for sales on preferential terms can easily lead to the creation of a privileged group, subject to relatively little outside competition. The danger is greatest when approved lists are drawn up with criteria for admission which are arbitrary; admission to the lists is usually strictly limited where potential competitors of the candidates have an effective voice in the selection. It is recognized that manufacturers have a legitimate interest in the service given by distributors and may therefore need to select carefully those handling their goods, but it is felt that a manufacturer should be able to safeguard his interests by his own arrangements with individual distributors.

Collective agreements for withholding supplies for the enforcement of resale price maintenance and other trading rules are open to objection, particularly when these powers are used against concerns which are not members of the association. (There is a reservation by one member signing the majority report who does not consider that collective arrangements for the enforcement of resale prices prescribed by individual manufacturers in general operate against the public interest.) Aggregated rebates are felt generally to encourage the spreading of orders in ways which may not promote the most efficient production and are likely, where common price systems exist, to render independent competition more difficult.

Discussing the implementation of their conclusions, they say that once it is accepted that the practices are generally harmful it is wrong that they should be permitted to continue because a few exceptional cases may be found in which they are on balance advantageous. A general prohibition would give industry clear and unequivocal guidance of the Government's policy. It would be much more effective than placing reliance on voluntary abrogation. The report therefore recommends that all the practices falling within its terms of reference should be prohibited by law, provision being made for certain defined exceptions.

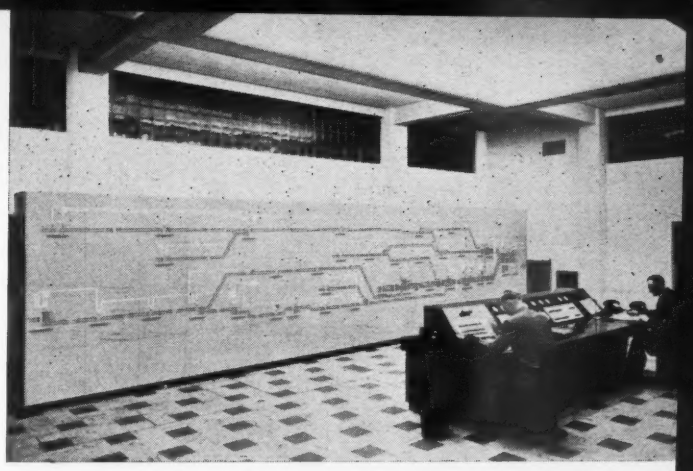
Minority Report

The minority of three express the view that a general statutory prohibition would create a degee of inflexibility which might in the future prove undesirable. They would be prepared, however, to accept the idea of compulsory registration considered but rejected by the majority. This, they think, might serve two useful ends. First, the publicity entailed would be salutary, and secondly, the register would form the basis for the selection of agreements for the detailed examination of their operation which, in the members' judgment, would alone warrant a decision that a particular arrangement was against the public interest and should be prohibited. "We think it is clearly in the public interest that contracts and conditions of sale lawfully made or imposed should be observed," say the dissenting members, who see in principle no objection to persons of like interests joining together to secure the enforcement of lawful obligations to which one of them is a party. Equally, they do not feel that the retailer who sells below or above the prescribed retail price is deserving of any sympathy. Where tribunals exist, they say the evidence shows that this procedure is fair and in conformity with the law.

* H.M.Stationery Office, price 3s 6d.

Remote Supervisory Control

BRITISH RAILWAYS SOUTHERN REGION INSTALLATION

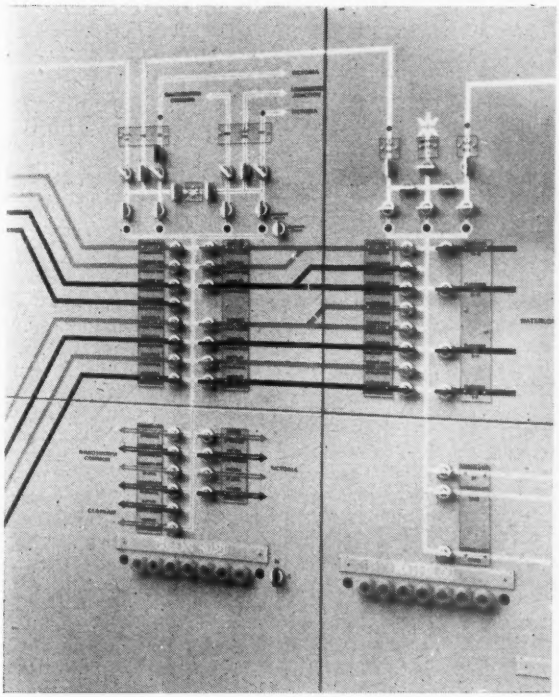


THE most extensive remote supervisory control system yet provided for railway electrification in Great Britain is being installed in connection with the London area change-of-frequency scheme of British Railways, Southern Region. When this change-over to 50 c/s h.v. supply is completed, 71 rectifier substations, 70 track paralleling huts and a number of supply points and switching stations will be controlled from three control stations at Raynes Park, Lewisham and Selhurst.

All the remote supervisory control apparatus is being supplied by the General Electric Co., Ltd., and the control stations at Raynes Park and Lewisham are already in operation. In the design of the equipment special attention has been paid to speed of working, an important feature being the provision for selecting track feeder circuit-breakers at each substation in groups, and operating them simultaneously when required, as well as individually. To avoid control operations being delayed by indications, separate control and indication cable cores are used.

The small size of the discrepancy switches on the mimic diagram, which can be mounted when necessary at one inch centres, has enabled the complex network of lines supervised from Raynes Park to be shown as a geographical diagram on a straight board 29ft 5in long and 7ft 7in high, with the switches in the correct positions on the diagram according to the tracks or feeders controlled by their associated circuit-breakers. A total of 527 circuit-breakers will eventually be controlled from this board, and 627 indications (including alarms) will be received.

Above: Mimic diagram and operators' desk at Raynes Park. Below: A section of the diagram showing the close spacing of the discrepancy switches



The advantage of the small switch dimensions is particularly apparent where multiple tracks have to be shown on the board. On the Raynes Park diagram, for example, there is an eight-track section from Waterloo through Queens Road station, and some 17 miles of continuous four-track main line.

The control operates on the d.c. total count code system with 50 V on the pilot lines. When a circuit-breaker is selected by operation of one of the discrepancy switches on the panel, a point is marked on a selector in the form of a multi-point rotary switch. Depression of a " close " or " open " push-button causes the sending selector at the control station and the remote receiving selector to rotate in unison. When the selectors reach the points corresponding to the one which has been marked, a relay is operated, but the circuit controlling the breaker thus selected is not completed until the transmitter has reached its final step and the receiving selector has followed suit.

The stepping of a receiving selector is controlled by trains of positive pulses sent over pilot lines from the control station. Coding for selection of the unit of substation equipment required, and the particular item within that unit to be controlled, is effected by the insertion of negative pulses in some of the gaps between positive stepping pulses. Selection of equipment is on the basis of supervisory units rather than the substation, each unit comprising apparatus with a capacity for the control and indication of four a.c. breakers and eight d.c. breakers.

Indication of the position of a breaker is given by connecting its auxiliary contacts to points on a sending switch through which relays are energized at the control station. The total count check on the impulses and the form of coding are essential safeguards to ensure that only the switch which it is intended to operate will respond to the control operation.

Below the group of discrepancy switches for each substation on the panel there are a pair of indicator lamps and a row of push-buttons. If a circuit-breaker trips automatically, an alarm bell rings at the substation after a lapse of 2·5 to 4·5 sec, and the indicator lamps below the substation nameplate light up. Simultaneously the lamp incorporated in the discrepancy switch corresponding to the circuit-breaker concerned begins to flash and the " stop alarm " push key is illuminated.

The operator then turns the discrepancy switch through 90 deg to correspond with the open condition of the circuit-

breaker, this action extinguishing the lamps. If the alarm bell is silenced by operating the " stop alarm " push key before the discrepancy switch is turned, a buzzer continues to sound until the switch is operated.

To reclose the circuit-breaker the operator turns the discrepancy key through 90 deg to the closed position, whereupon its lamp glows steadily and the red window in the " close " push-button below the station nameplate is illuminated. On depressing this push-button the control impulses are sent out as already described. Its red window light goes out, but a " cancel " push-button lights up and if necessary the operation can be cancelled by depressing this push-button at any time while it is illuminated.

Completion of the operation is indicated by the lights in the discrepancy key and " cancel " push-button being extinguished. With a skilled operator the total time elapsing from receipt of a trip alarm to receipt of the reclosed indication is from 8·3 to 13 sec. A separate " open " push-button has a green illuminated window.

Rectifier d.c. circuit-breakers are indicated by yellow discrepancy lamps but do not have individual switches on the panel. When a rectifier a.c. circuit-breaker is closed, the rectifier d.c. discrepancy lamp flashes during excitation of the rectifier and is extinguished on the automatic closing of the associated rectifier d.c. circuit-breaker.

Substation faults are indicated by the flashing of the " substation " fault lamp. When the fault is acknowledged by pressing the " stop alarm " push-button, the " substation fault " lamp glows steadily, and continues to do so as long as the alarm condition exists. Each group of substation push-buttons also includes a " lamp test " push-button which enables the continuity of all warning lamp circuits in the substation group to be checked.

Remote metering facilities are provided on the operators' desk. Lever keys enable substations which have two or more rectifiers to be selected for the purpose of reading the total d.c. current at such a substation at any moment.

Two operators are on duty in the Raynes Park control room. Both can work independently, as 12 separate control systems are provided, each controlling a maximum of six substations and track paralleling huts or other equipment. As a safeguard against loss of power supply to the tracks, due to the temporary failure of a control system, two control systems follow each route. Substations are connected alternately to one or the other system. The intermediate track paralleling hut is satellite-operated from the substations on each side, and the supervisory control is so arranged that the breakers feeding towards the first substation are controlled from the second substation and vice versa. This ensures that in conditions of a supervisory control failure on one system, the track can always be kept energized.

Two pilot pairs are provided for all systems, and pilots are automatically tested every 30 minutes for continuity and insulation, a breakdown being signalled to the control desk. It would be possible for two " perfect " operators to restore the load on the whole system after every switch had opened in approximately 5 minutes.

The supervisory apparatus is divided and housed in two apparatus rooms, and substations are connected alternately to each apparatus room so that in the event of a fault in either half, adjacent substations are not put out of action and track sections can continue to be fed from one end. Duplicate control station batteries and chargers are provided.

The equipment has been designed to the requirements of the chief electrical engineer of the British Transport Commission, and is being installed under his direction.

PATENTS IN 1954

WITH a slightly smaller staff (1,106 against 1,111) the Patent Office last year dealt with increased business. The report for 1954 of the Comptroller-General of Patents, Designs and Trade Marks (H.M. Stationery Office, 1s 3d) shows that during the year there were 37,871 applications for patents (against 36,401 in 1953) and 17,985 (against 17,882) patents were sealed. Designs registered numbered 7,316 (7,435) and trade marks 8,185 (7,261).

Mention is made of the continued inability of the Patent Office to recruit sufficient numbers of suitably qualified assistant examiners, even to replace losses from retirement and death. Unless this position can be remedied the arrears of unexamined specifications (25,879 at the end of 1954) must continue to rise.

Dealing with the trend of invention, the Comptroller-General says that the electrolytic production of titanium has attracted attention. In the field of electrical engineering interest was shown in the development of remote control of underground mining equipment, in the use of transducers as substitutes for relays and discharge tubes in protective systems, in the construction of small relays insensitive to acceleration for use in high-speed aircraft, and in the electrical control of gas turbines. In telecommunications interest continued in telephone exchanges. The main emphasis in television inventions was on multiplex transmission of colour television, and telemetering circuitry using binary code techniques has attracted attention.

In the direction of electric computers and allied equipment there has been a trend towards greater compactness; a pronounced interest in data-storage devices; and the use of bi-stable magnetic and equivalent units for such devices. Increased attention has been given to the solution of equations relating to complex physical and engineering problems by electric analogue computers using basic circuit elements as the components of the equations. Development of transistors has continued, especially in the formation of p-n junctions and in the use of so-called " intermetallic compounds." In the aircraft field the development of electric flight-simulators has been prominent.

As regards machine tools, development continued in all forms of copy machining and the application of electronic control systems. There has been much activity in the development of electric spark erosion methods and in welding techniques.

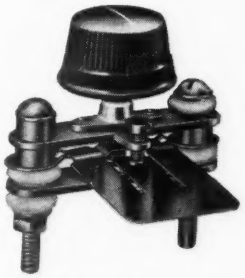
The complete specifications accepted during the year covered 20,569 primary inventions and 8,929 subsidiary features. Among them were the following:—Electric lamps, incandescent, 53 primary, 6 subsidiary; electric discharge or vapour tubes, 430 and 89; heating by electricity, 157 and 62; turbines, etc., 236 and 128; electric railways, etc., 4 and nil; dynamo-electric machines, 188 and 67; electric currents, converting, etc., 136 and 60; electric supply, etc., systems, etc., 310 and 164; electricity, conducting, etc., 87 and 37; electricity measuring, etc., 269 and 92; electric couplings, etc., 166 and 49; electrolysis, 74 and 44; galvanic batteries, 53 and 9; electric motor control systems, etc., 92 and 7; electric switches, etc., 324 and 150; bells, etc., 11 and 12; electric signalling systems, etc., 123 and 66; telephones, etc., electric, 274 and 58; nucleonics, 4 and 6; telegraphy and television, 227 and 120; electric impedance networks, 94 and 30; radio systems and sets, 148 and 74; electronic discharge tube circuits, 197 and 115; and radio navigation, radio-location and aerials, 209 and 31.

Reference is made by the Comptroller-General to the increasing costs of operating the Patent Office. Fees were raised recently but a further increase may be necessary.

NEW ELECTRICAL EQUIPMENT

Variable Thermostat

The "Type O" variable snap-action thermostat unit introduced by OTTER CONTROLS, LTD., Market Street, Buxton, Derbyshire, has been specially designed for easy fitting into heating apparatus and to meet the demand for



Otter "Type O" thermostat unit

a simple and reliable, yet inexpensive, thermostat to give variable temperature control. It incorporates a bi-metal blade especially sensitive to temperature change because bi-metal flexes across its width as well as along its length. The blade is the only moving part, there being no spring, magnet or toggles. Two types are available, one with a temperature adjustment knob and the other fitted with an insulated spindle in order that the users may fix the knob to suit their own requirements. The rating is 20 A at 250 V a.c., and the unit has a temperature range variation of approximately ± 20 deg F.

Storage Heaters

Two new models to their range of storage heaters are announced by THERMODARE (GREAT BRITAIN), 79-80, Petty France, London, S.W.1. These are horizontal in design and have an overall height of 22in. They are supplied in 1½ kW and 2 kW sizes and the respective prices are £14 and £15. The new standard 2 kW model

Thermodare horizontal storage heater

(vertical type) is now priced at £15 but the prices of the standard 1 kW and 1½ kW models remain unaltered at £11 and £12 each respectively.

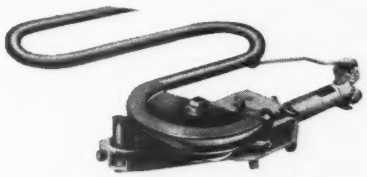
Flameproof Gate End Box

To their range of mining equipment W. & H. NELSON, LTD., Bellshill, Lanarkshire, have added a new design of flameproof contactor operated gate end box. Buxton certificates have been issued for the equipment. Many of the latest N.C.B. specifications have been incorporated in the design, and the gate end box is a robust unit with a versatile list of applications for the control of various portable equipment used in mines.

Fitted in a case of fabricated mild steel construction with removable top cover and hinged front cover, it is mounted on channel type skids for easy transportation. Other features of the gate end box are intrinsically safe remote control circuit; solenoid type overload relays with oil time lags; and a strongly constructed isolating switch.

Bending Machine

In response to a demand for a light portable hydraulic machine capable of



Chamberlain Industries ratchet bending machine

bending non-ferrous tubes up to 3in diameter, CHAMBERLAIN INDUSTRIES, LTD., Staffa Road, Leyton, London, E.10, have devised a bending head to fit on to the hand operated self-contained pump. This transfers the straight line thrust of the ram into a rotary movement which is necessary in order to bend light gauge tubes to prevent wrinkling and flattening during the bending operation. The bending arm houses an adjustable back roller.

Two of the main features of the machine are an automatic patent two-stage pump and the method of clamping the tube to the forming die allowing for the production of close set bends, with a minimum length of straight between radii. The unit is portable and no site fixing is necessary.

Screwglass Fittings

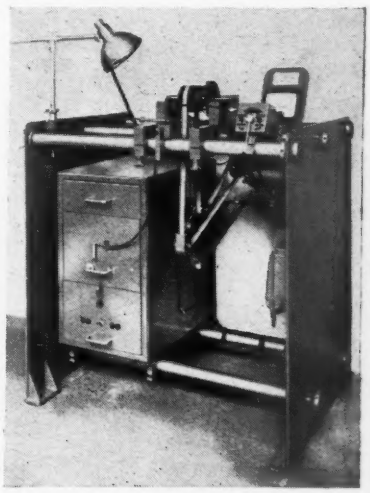
Two new ranges of 60 W weatherproof screwglass lighting fittings have been introduced by the SIMPLEX ELECTRIC CO., LTD., Broadwell, Oldbury, Birmingham. They have been designed to reduce the glare normally associated with well-glass fittings and construction permits adaptability to a wide range of fitting combinations. For surface mounting the basic unit may be attached direct to the ceiling or to 2in centre conduit boxes and with the side-entry top attachment the need for unattractive swan-neck brackets is eliminated. Two types of finish are available, either cast-iron acid resistant vitreous enamel or "L.M.6" high corrosion-resistant aluminium alloy, and the lampholders may be specified in Bakelite or porcelain. The prices of the basic units are 10s 6d and 12s.

Simplex 60 W screw-glass fitting with side-entry top attachment

Dynamic Balancing Machine

The type 1252 dynamic balancing machine just introduced by DAWE INSTRUMENTS, LTD., 99, Uxbridge Road, London, W.5, is a standard unit capable of taking components up to 100 lb in weight. The rotor runs in two horizontal half bearings carried in cradles by flat springs. The cradles are mounted on two rigid tie bars joining the main framework, so that their position may be adjusted to take any rotor length in the machine's capacity.

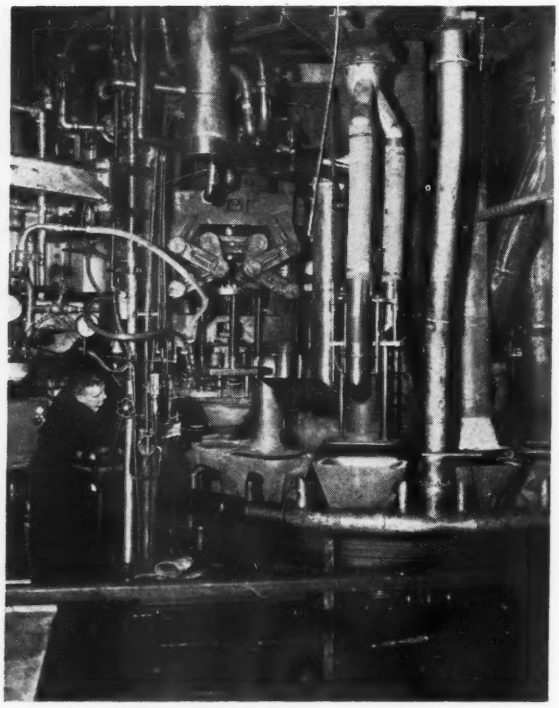
The machine, as illustrated, weighs about 100 lb and measures 45in by 31in by 56in high. The electronic equipment required is housed in the cabinet to the left. The construction is such that much larger components can readily be accommodated by an increase in the size of the mechanical parts, without modification to the associated electrical gear. The degree of accuracy is such that a 100 lb motor can be balanced to within 0·0064 in-oz.



Dawe 1252 balancing machine

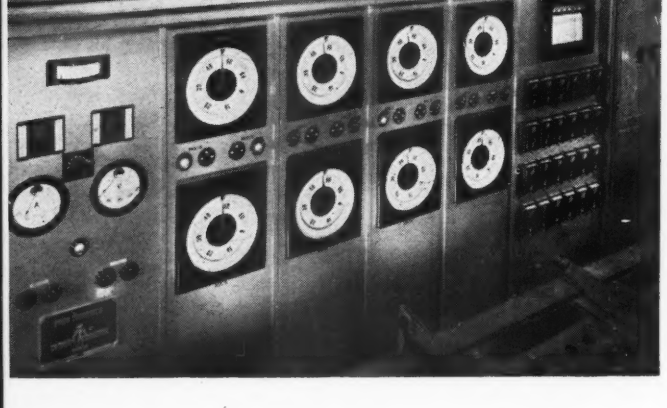
Cathode-Ray Tube Manufacture

Pilkington Bros. Operate New Glass Component Plant



General view of the automatic machine, giving some idea of the engineering design involved

This panel regulates the lehr temperature



THREE months ago a new glass manufacturing plant for cathode-ray tube components was put into operation in the St. Helens works of Pilkington Brothers, Ltd. This £1 million plant is the only one of its kind in this country and using the latest automatic methods it makes cathode-ray tube components for almost all types of British television receivers.

The company first entered the cathode-ray tube business in 1948 at the request of the Government. At that time most British tubes were blown or pressed by hand methods. There was thus an unavoidable expenditure of foreign currency since a large proportion of the tube components were imported. As large quantities of reasonably priced tubes would be required automatic manufacture was decided upon. In 1949 9in tubes were produced on a commercial scale using a small pot furnace and lead glass. In 1950 when a suitable glass was found production was transferred to a continuous glass furnace and later the same year production was further increased by using a continuous tank furnace.

This furnace is still used for small sizes but it has been supplemented by a second furnace of similar size which was commissioned three months ago. The equipment operates under licence from the American Corning Glass Company.

The cost of the glass in a cathode-ray tube represents only a small proportion of that of the finished tube. For a 14in tube, for example, glass components account for only about 5 per cent of the total price of a replacement tube. Since manufacture first began in 1949 there has been a reduction of over 50 per cent in the cost of tube glass components and this trend appears to be continuing.

The components made at St. Helens are the largest high quality pressings which have been produced in this country and they come off the machine at a rate of about one every six seconds, or more than twice as fast as by hand methods. The new plant can be adapted to produce, in quantity, components of any size likely to be required by any British set manufacturer and it can make at least two million units a year.

Description of Process

A cathode-ray tube consists essentially of two parts; the front or screen, and the cone. These two parts are made independently from special quality glass and are eventually sealed together and also to a neck tube at other works. All of the cones are made by automatic machines, as are most of the screens, but some smaller screens, including all of the circular types, are made by hand. As the size of the tube increases it becomes more necessary to employ fully automatic methods and for the larger sizes such methods are essential. When the raw materials have been selected, crushed and sieved they are weighed and mixed; from this point the mix is known as "frit." Frit is carried by fork-lift trucks to the mouth of the melting furnace into which it is fed together with cullet (broken glass of the same mix). Cullet is important since it provides a nucleus of fully homogenized glass and facilitates the melting of the raw materials. The principal raw materials are sand, soda, potash and barium carbonate with small

quantities of nickel and cobalt, which give the glass the grey colour which is required to increase contrast and give a good image even in a lighted room.

Melting is carried out at a temperature of about 1,500 deg C, in a 3ft deep rectangular tank containing about 350 tons of molten glass. Heating is done by producer gas made in the works. The furnace part of the new plant is similar to that which was installed when production of cathode-ray tube components first began in earnest in 1950. This is natural since melting processes are virtually the same throughout glass manufacture. The tank is in full daylight because the old need to be able to see the colour of the hot glass has now been superseded by modern instrument control.

Molten glass is fed into moulds situated on a rotating table through channels known as fore-hearths. Each gob of molten glass (for a 17in screen this would weigh about 8 lb) is delivered into a mould of the required shape. A pneumatic plunger descends and completes the operation.

Where the cone exceeds a size of 17in a different method is adopted. In this case the gob of molten glass is dropped into a mould of the required shape and spun so rapidly that it is thrown out by centrifugal force into the shape of the mould. The reason for this operation is that by its employment a glass of thinner substance can be produced than by the normal pressing method, and not only does this save weight but also cost.

Carefully controlled cooling of glass pressings is essential if stresses are not to be set up within the components. Because of this, the screens and cones, when they have cooled sufficiently to be taken from the moulds, are placed in a kiln and kept at a fairly high temperature for some minutes before being brought down gradually to room temperature. This process of annealing is carried out in lehrs of advanced design which are of Belgian manufacture. They are electrically heated and fitted with automatic temperature control.

The glass is checked as it leaves the lehr to ensure that all internal stresses have been removed. This is particularly important with large screens. The inspection is done on a polariscope which enables the operator to compare the strain pattern in the sample with that of a good standard model by his side. Those that satisfy requirements are passed on to be packed ready for despatch.

A very high standard is essential for the screens since the slightest defect may affect the image. Each component is critically examined for defects, surface imperfections and dimensions. Any screens requiring surface treatment are transferred to the grinding and polishing section. Where the press imparts slight wrinkles and mould marks to the glass surface, these are removed by buffing. After polishing, all screens are subject to a final inspection.

The components are not sealed together by Pilkingtons as most television tube bulb producers prefer to do their own sealing. Separate screens and cones can be fitted inside each other and a great saving in space is achieved. The screens are stored on pallets and transferred to storage warehouses by fork-lift truck.

Loss on Transport Services

Further Deficit Foreshadowed

A FINAL net deficit of £11·9 million, after meeting interest and other central charges, is recorded in the British Transport Commission's report and accounts for 1954.* This loss, which compares with a surplus of £4·2 million in 1953, increases the accumulated net deficit since 1948 to £39 million. At a Press conference last week Sir Brian Robertson, chairman of the Commission, said that another deficit, for the current year, was "inescapable." The Commission would make a determined effort to return to a state of balance by 1956, but it would not be easy.

The working surplus (before providing for interest charges, etc.) last year was £45·5 million, a reduction of £13·9 million on the previous year. This result, despite a steady improvement in operating efficiency and economy, was brought about mainly because fares and freight charges were never able to catch up quickly enough with rising wages and prices. Over all the Commission's road and rail services the total number of passenger journeys last year was 7,611 million, a reduction of 1·3 per cent. Apart from the effects of the bus strike in October, television, new housing and increased private motoring are suggested as contributory factors in the significant decline in short-distance traffic. It is thought that the high level of prosperity which the country enjoys has tended to encourage users of public transport to run their own vehicles.

Referring to the railway modernization plan, the report says that there will be an initial period during which the new capital expenditure will not improve the financial position. The cost of carrying to-day's passengers and freight traffics must be recovered so far as competitive conditions will allow, a condition precedent to undertaking a bold and far-reaching plan of new equipment being that the enterprise must not be allowed to get into a position of irredeemable unbalance in the meantime. Last year the Commission spent about £66 million on new rolling stock, vehicles, ships, plant and equipment and £10 million on civil engineering works, etc. The most powerful diesel-electric locomotive on British Railways, the 2,000 h.p. No. 10,203, was brought into service. The 2,500 h.p. gas turbine locomotive, No. 18,000, was employed on main-line duty in the Western Region; the more powerful No. 18,100 (3,000 h.p.), however, was out of service for improvements and modifications. Further development was also carried out on the experimental coal-burning gas turbine.

In connection with the electrification proposals for the lines from Euston to Manchester, Liverpool and Birmingham, a survey was undertaken to investigate the comparative costs of the high voltage a.c. and 1,500 V d.c. systems. To test the reliability of prototype apparatus for automatic train control, the full-scale trial was extended. Noise interference from the 1,500 V d.c. traction system on the Manchester-Sheffield-Wath line on both cable and overhead telephone circuits was investigated.

Considerable progress was made in 1954 with the plans to introduce lightweight diesel trains on carefully selected sections to recover traffic to rail by the attraction of higher

* H.M. Stationery Office, price 3s 6d (report) and 6s 6d (accounts).

speeds, greater frequency of service and the comfort of modern rolling stock. The Leeds-Bradford-Harrogate service was opened in June, and though there were teething troubles the service has brought a substantial increase in the number of passengers, and some reduction in cost. Likewise the introduction of full electric services on the Sheffield-Manchester main line has been "successful in every way," and especially in increasing the volume of passenger traffic carried.

Nevertheless, a special survey of the various types of train service provided by British Railways has made it clear that for many of the slow or stopping services, which fail to cover their direct costs by many millions of pounds a year, there is no remedy except withdrawal and the substitution of road services as appropriate. Local opposition to this process is, however, very great.

The acute problems of passenger transport in Glasgow, to which the Report of the Inglis Committee to the Commission in 1951 had directed attention, were the subject of discussions with the Glasgow Corporation through a Joint Committee on which the Commission is represented. The Commission has taken the view that substantial electrification of certain suburban lines, as suggested by the Inglis Report, is probably the only satisfactory solution to the city's transport difficulties. The large capital expenditure entailed could not, however, be undertaken without the collaboration of the Glasgow Corporation in certain important respects.

The fulfilment of the railway modernization plan will require a substantial increase in the Commission's technical staff. To ensure that a shortage of technicians shall not hinder the achievement of the plan an energetic policy of recruitment has been agreed, and during 1954 many consultations were held with the principals of technical colleges, and with representatives of local education authorities. The year saw the introduction of additional training schemes designed to promote the recruitment of new staff, particularly into the signal engineering and mechanical and electrical engineering departments of British Railways. Short induction courses were again given to graduates entering the railway service. Encouragement is given in all schemes to entrants to attain professional status appropriate to their work.

British Railways	1953	195
Track miles:		
L.v. conductor rail, d.c.	2,167	2,179
H.v. overhead, d.c.	218	218
H.v. overhead, a.c.	19	19
Electric locomotives, 630–660 V	5	5
Electric locomotives, 1,500 V d.c.	60	66
Diesel-electric passenger	4	5
Diesel-electric mixed traffic and freight	238	239
Gas-turbine electric	2	2
Electric motor coaches	2,121	2,150
Train-miles loaded, electric, millions	47·8	48·4
Electricity consumption (traction), million kWh	855	891
Electricity consumption kWh/car-mile	2·61	2·67
London Transport Railways		
Track miles	530	530
Electric locomotives, passenger	16	15
Electric locomotives, service*	51	58
Electric motor cars	2,505	2,479
Passenger journeys, millions	580·0	575·3
Rev./passenger-mile	1·26d	1·31d
Rev./car mile	22·65d	23·97d
Working expenses/car-mile	22·19d	23·12d
Electricity consumption, million kWh	604·5	603·8
Electricity consumption, kWh/car-mile	3·11	3·13
London Transport Trolley-buses		
Track miles	494	494
Number of vehicles	1,797	1,764
Vehicle miles, in passenger service, millions	74·2	71·1
Working expenses/vehicle-mile	29·41d	31·19d
Passenger journeys, millions	746·6	718·0
Electricity consumption, million kWh	209·7	200·8
Electricity consumption, kWh/vehicle-mile	2·83	2·82

* Including one diesel-electric locomotive

Fuel Research

Investigations on Air Pollution

THE Report of the Fuel Research Board of the Department of Scientific and Industrial Research, with the report of its director, Dr. A. Parker, published last week by H.M. Stationery Office at 3s, covers activities during 1954. The chairman of the Board is Professor Sir Cyril Hinshelwood, F.R.S., and electrical interests are represented by Sir John Hacking.

To implement the recommendations of the Beaver Committee on Air Pollution would, it is stated, call for considerable extension of the work of the Fuel Research Station. Since the beginning of 1952 the number of local authorities and other organizations co-operating in measurement of pollution increased by 50 per cent and was now 200, using between them 1,500 instruments. About half of these were for measuring SO_2 monthly by the lead peroxide method or daily by the volumetric method. Daily records of smoke were also made. Reduction of pollution was closely linked with fuel economy. Much more free burning coke was required for the 12 million open-fire grates for which ordinary coke was unsatisfactory. Work at the station had shown how the more plentiful weakly coking coals could be carbonized for the purpose.

The calorimeter building had proved indispensable for obtaining accurate data on room-heating efficiencies. With simple open fires throat restrictors could reduce the amount of smoke issuing from chimneys by one third and increase the useful heat, radiated or convected, by reducing the rate of burning. Leaks through badly fitting doors of closed stoves might lessen efficiency by one quarter.

About 90 per cent of the germanium in coke fed to a producer was volatilized during carbonization at from 800 to 1,100 deg C, but only a proportion was retained in flue deposits, the remainder passing out of the chimney stack as dust, samples of which had been found to contain 1 per cent of germanium.

Radioactive tracers had proved of value in investigations of corrosive bonded deposits on boiler-tube exteriors, which were often cemented by sulphates or bisulphates of the alkali metals volatilized from the fuel bed as chloride. The chloride then reacted with the oxides of sulphur in the flue gas to give sulphates. Most of the sulphate was formed from SO_2 and not SO_3, but the finding of means to reduce the catalytic activity of the iron oxide on the tubes would improve conditions.

A straight-through combustion chamber for coal-fired gas turbines was being built in which ash was not deposited during operation. Recovery of sulphur and ammonium sulphate from flue gases in a pilot plant of a design pioneered by Simon-Carves, Ltd., had given sufficiently encouraging results to justify a decision of the Central Electricity Authority to install a plant at one of its power stations to treat 2 million cu ft of flue gas an hour by a two-stage process.

INDUSTRIAL NEWS

Transformers for St. Lawrence

The English Electric Co., Ltd., has received an order from the Power Authority of the State of New York for two transformers to be used in connection with the St. Lawrence Power Project. A hydro-electric power station is now being erected on the St. Lawrence River jointly by the Canadian and United States authorities. For the Canadian side the English Electric Co. of Canada, Ltd., is building in Toronto the water turbines to the designs of the English Electric Co., Ltd., in England.

On the American side, part of the power generated will be stepped up to 115 kV and part to 230 kV. The transformers which the company is now to build will couple these two busbars together for the interchange of power. They have an output of 120,000 kVA with a voltage ratio of 230/115 kV with the windings auto-connected. A tertiary winding is provided for the supply of power at 13·8 kV. They are three-phase units and the cooling is of the OFW type (pumped oil circulation through water coolers). The main windings will be impulse tested at a level of 900 kV. These transformers are similar to an 80,000 kVA unit built by the company and now in service at the Folsom Dam in California. They will be arranged so that a group of four generators is connected to each bank of transformers.

Mobile Showroom

The accompanying pictures show a mobile showroom which went into service last week in Shropshire. It is a 1939 Leyland TS8 single-decker bus that used to carry passengers from Manchester to Ringway Airport. The Midlands Electricity Board bought it recently from Manchester Corporation and has modified and redesigned the body and made it into a showroom on wheels. Built into it are an electrical ring main, a pressurized water system, electrical heating equipment working off the diesel engine, wardrobes for staff clothing and fluorescent lighting. A low step at the rear gives easy entrance to the interior, which has ample space for a representative display of electric cookers, water heaters, T.V. sets and other items of domestic electrical equipment. Although the Board uses caravans as showrooms in some areas, this is the first vehicle of its kind to go into service. It is proposed to obtain three similar vehicles for use in the Wolverhampton and Worcester Sub-Areas. This first mobile showroom is attached to the Board's Shropshire and Herefordshire Sub-Area.

Measuring and Control Apparatus Guide

The products of the industrial measuring and control apparatus industry, which makes much of the equipment that will be in evidence when the "automatic factory" is a reality, are in growing demand. The British Industrial Measuring and Control Apparatus Manufacturers' Association has accordingly taken the opportunity of publishing a Buyers' Guide to give engineers and industrialists information on where to obtain specific items of equipment. It is intended to supplement factually the BIMCAM Handbook, until another handbook can be prepared. The Guide is divided into two sections, one giving a list of members of the Association with their products, and the other an alphabetical list of products, with the names of companies supplying them. Single copies can be obtained free from the Association, 21, Tothill Street, London, S.W.1; for larger orders a charge will be made at the rate of 7s per ten copies.

Electrical Machinery Trades

The Association of Electrical Machinery Trades held its tenth annual general meeting at the St. Ermin's Hotel, Caxton Street, Westminster, London, S.W.1, on 27th June. The meeting was preceded by a luncheon presided over by the retiring chairman, Mr. C. E. Collins. In presenting the report of the Council for the year Mr. Collins mentioned that several new features had been introduced in the past twelve months. The Association had become affiliated to the London Chamber of Commerce, bulletins containing information of particular interest to the members were now circulated at regular intervals and the Association's journal, *Electrical Machinery*, had been revised. He referred to the success of the annual ball at the Savoy Hotel and the annual convention at Paignton, and paid tribute to the work of Mr. J. T. Morgan, the secretary, and his staff.

Following the adoption of the report, Mr. F. H. Washington, of E. J. Wilcock, Ltd., Birmingham, was elected as chairman for the ensuing year. A vote of thanks was accorded to the retiring chairman for his conduct of the Association's affairs. Mr. A. H. Spindler (A. Cooksley & Co., Ltd.) was elected vice-chairman

A mobile showroom recently put into service by the Midlands Electricity Board

and Mr. E. W. Clark (Industrial Electrical Co., Ltd.), treasurer.

A general discussion on matters appertaining to the future well-being of the Association followed, which developed into a debate covering a wide field including the latest developments in electronics, liaison with other organizations and the venue and programme for the 1956 convention.

Mobile Shops for Turkey

The first of a fleet of sixty mobile shops was formally handed over by Smith's Delivery Vehicles, Ltd., in London, last week to the Migros-Turk organization for operation in Istanbul. The shop is based on the Commer 5-ton "Superpoise" chassis, fitted with a Perkins P-6 diesel engine. The body, designed and manufactured by Smith's Delivery Vehicles, in association with Duple Motor Bodies, Ltd., is in aluminium throughout and is thus not subject to deterioration in any climate. From the electrical point of view the main interest in the mobile shop is the Frigidaire refrigeration equipment installed to accommodate meat and fats. This consists of a two-compartment built-in service cabinet with a capacity of about 62 cu ft. Refrigeration is supplied by a $\frac{1}{3}$ h.p. air-cooled condensing unit, operating in conjunction with a special Winget Dole eutectic hold-over plate. This is housed in a special casing beneath the chassis. The equipment is designed to maintain temperatures of 48 deg and 58 deg in an ambient temperature of 97 deg F.

Wolf Electric Tools

The progressive development in sales of Wolf electric tools in Australia over the past twenty years has justified the establishment, in conjunction with their associates, Consolidated Agencies Pty., Ltd., of a new company under the name Wolf Sales, Pty., Ltd. This company has taken over the Wolf selling organization throughout Australia. The directorate of the new sales company includes Mr. D. K. Nicholas as chairman, Mr. C. F. Macdonald, managing director, and Mr. B. E. Nicholas, all resident in Australia, and Mr. R. F. Hatto, sales director of the manufacturing company. The Australian company will operate from 122-124, Sussex Street, Sydney.

Brush Airlift Operation

In order to avoid temporarily laying off employees during the dock strike, the Brush Electrical Engineering Co., Ltd., Loughborough, chartered an aircraft to fly to Stockholm, Sweden, to obtain 6½ tons of urgently required air circuit-breakers. The chartered aircraft left Stanstead Airport for Stockholm at 9 o'clock in the morning and arrived back at Blackbushe at 11.45 the same evening. The goods were immediately transferred to waiting lorries and they arrived at the Brush works at 7.30 the following morning, the whole operation taking 22½ hours.

Control Gear Manufacture in Ireland

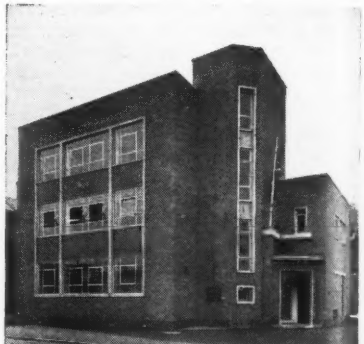
G.W.B. Furnaces, Ltd., which is jointly controlled by Gibbons Brothers, Dudley, Worcs, and Wild-Barfield Electric Furnaces, Ltd., Watford, has chosen Bangor, Co. Down, for the building of a factory to manufacture electric control gear. Some time must elapse before full production is reached, but it is hoped to employ upwards of 150 workers.

Pakistan Fan Import Duties

The Government of Pakistan has accepted a recommendation by its Tariff Commission that the protection of the home electric fan industry should continue up to 31st August. The import duties on fans will remain at 45 per cent *ad valorem* (general) and 35 per cent (United Kingdom preferential). The full rebate of duty on imported raw materials for the home industry is being continued.

Leicester Wholesalers' New Premises

Earlier this year Burn & Orson Wright, Ltd., electrical wholesalers and engineers' merchants, of Leicester, moved to new premises in Burley's Lane and Grafton Place, Leicester. As is usual when transferring to new premises it has taken time to become established, but the organization and arrangement of the various departments is now completed. These are the third premises to be occupied by the company. The first, when the company was formed in 1933, were in Yeoman Lane, and four years later a move was made to Southgate Street. The need for new premises soon became apparent, but with the last war intervening nothing could be done until 1953. The new premises have an area of 10,000 sq ft with provision for doubling this area when required. In addition to a trade counter and an "indoor shop window," ample store accommodation has been provided and there is a conduit and tubing bay. The governing director of the company is Mr. L. B. Burn.



The new premises of Burn & Orson Wright, Leicester

Works Visits

Specialists from seven countries who took part in the recent course on "The Use of Radio-Isotopes in Engineering" recently visited the laboratories and works of Ekco Electronics, Ltd., at Southend-on-Sea, where they saw a wide range of nucleonic equipment in production.

Mr. M. R. Metcalfe, C.M.G., O.B.E., High Commissioner Designate for the Central African Federation, at present touring industrial organizations in this country before taking up his appointment in Salisbury, Southern Rhodesia, recently visited Liverpool and spent

Directors, executives and staff at the annual sales conference of the Midland Electric Manufacturing Co., Ltd., in Shirley Park Hotel, Warwickshire, after the first day's session at the Tyseley Works

several hours at the factory of the Automatic Telephone & Electric Co., Ltd., during which he saw the latest developments in the telecommunication field, and also toured the company's new school of electronics, recently established to train graduates wishing to specialize in this field.

On 30th June Mr. F. J. Erroll, M.P., Parliamentary Secretary to the Ministry of Supply, accompanied by Mr. B. Kay, Midland Regional Controller (B.O.T. and M.O.S.) visited the British Thomson-Houston Co.'s Rugby works. After lunch with the directors and senior executives of the company the official party was conducted by Mr. H. E. Cox, manager of the Rugby works, on a tour embracing the turbine factory, gear factory, overspeed test house, heavy-plant factory, and electronics department.

Atom Plant Orders

Large contracts for extension to Britain's atomic power supply system have been placed with Babcock & Wilcox, Ltd., who supplied the steam plant for the original station at Calder Hall. The new contracts cover what is in effect three new Calder Halls. Eight steam towers, each 80ft in height, will be supplied to a new station to be known as Calder Hall "B." Two further installations totalling sixteen towers, will be supplied to a power station at Chapelcross, near Annam, in Dumfriesshire.

Australian "Dumping" Charge

The Canberra correspondent of *The Times* quotes Mr. R. W. Anderson, assistant director of the Australian Associated Chambers of Manufacturers, as saying that certain United Kingdom switchgear manufacturers were quoting uneconomic prices to the detriment of Australian manufacturers. Mr. Anderson alleged that in a recent call for tenders for switchgear the highest United Kingdom price was 50 per cent above the lowest United Kingdom price; the highest Australian price was 78 per cent above the lowest United Kingdom price. He claimed this as proof that the difference between Australian and United Kingdom prices was not due to Australian inefficiency and he called for a Government investigation into the matter.

Australian Quota Unchanged

Although there was again an excess of imports over exports in May, the Australian Minister of Trade and Customs has stated that there will be no intensification of import restrictions during the quota period 1st July to 30th September.

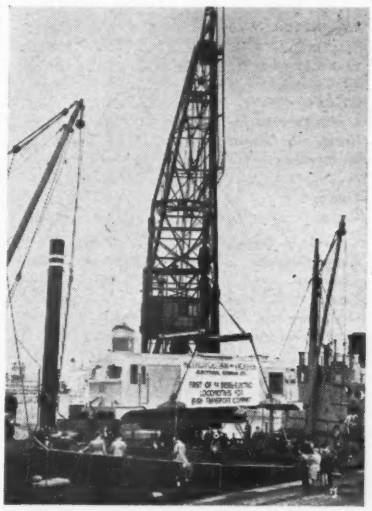
I.E.E. Section Summer Meetings

The British Thomson-Houston Co., Ltd., were hosts to members and friends at the summer meeting of the Radio Section of the Institution of Electrical Engineers, which this year was held at Rugby. Part of the programme consisted of a tour of the B.T.H. Rugby lamp works and the electronics factory, where a selection of electronic equipment was in various stages of production and assembly. The tour of the Rugby works concluded with a demonstration of domestic electrical appliances. Meanwhile some of the party had been visiting the new Post Office radio transmitting station at Rugby, which was an alternative to the works visit. The whole party met for lunch at Chesford Grange, Kenilworth, and then went on to Stratford-on-Avon, where they had tea before dispersing.

The Measurements Section of the Institution, as part of its summer meeting, visited the E.M.I. factories at Hayes, Middx, when 100 members and their ladies, after a tour of the factories, were entertained to lunch by the company at the Castle Hotel, Windsor.

Diesel-Electric Locos for Eire

The accompanying picture shows the first of ninety-four Metropolitan-Vickers diesel-electric locomotives for the Irish State Railways being lifted aboard ship at Manchester Docks on 1st July. For the completion of this contract, which it is claimed is the largest order for diesel locomotives ever placed in Britain, it is planned for s.s. *Westfield* to make two trips to Dublin every week, each time transporting a locomotive body and two or more wide-gauge bogies.



Metropolitan-Vickers diesel-electric locomotive being shipped at Manchester for Eire

Food Mixers

In our survey of domestic electrical equipment covering food mixers, published in last week's issue, we inadvertently omitted the "Romix-Super" mixer and fruit juice extractor, available from Fraikad, Ltd., 59, Brompton Road, London, S.W.3. Details of this appliance are as follows:—Capacity: 2½ quarts. Standard equipment: juice extractor. Additional accessories: shredder, blender, dough mixer and citrus fruit juice extractor. Finish: acid resistant "Melamin" casing. Price (excluding purchase tax) £17 17s. Purchase tax, £6 10s 7d. Price of accessories (excluding tax): shredder, £4 13s 6d; blender, £4 13s 6d; dough mixer, £15 2s 6d; citrus fruit juice extractor, £2 19s 6d. Purchase tax on accessories: shredder, 17s 2d; blender, 17s 2d; dough mixer, £2 15s 4d; citrus fruit juice extractor, 10s 11d. The single purpose blender is priced at £12 12s, plus £4 12s 2d purchase tax, and the single-purpose juice extractor is £14 2s 6d, plus £5 3s 1d purchase tax. The "Romix-Super" was illustrated in our issue of 4th March last, page 356.

Trade Announcements

Brook Motors, Ltd., announces the appointments of Mr. A. C. Woolard and Mr. E. Nicholson to its sales staff at the Plymouth and Huddersfield branches respectively. Both have served apprenticeships in the works.

Edwards High Vacuum, Ltd., has formed an Italian subsidiary company with offices in Milan in association with Societa Apparecchi Elettrici e Scientisici, with whom the parent company has had an agency relationship for many years. The new company, Edwards Alto Vuoto S.p.A., commenced trading on 1st July.

Philips Electrical, Ltd., announce that as from 1st July new terms apply on all products marketed by the Lighting Division. The new terms are being circulated to all concerns and undertakings on the Lighting Division mailing list.

Electrical Exports in May

In last week's review of electrical export trade in May it was inadvertently stated that India was Britain's chief customer. In fact, Australia held that position, India being second.

NEXT WEEK'S EVENTS

Tuesday, 12th July

LONDON.—Connaught Rooms, 12.30 for 1 p.m. Electrical Industries Club. Luncheon. Guest speaker, Mr. Tom O'Brien (T.U.C.).

Tuesday, 12th July, to Thursday, 14th July

HARROGATE.—Great Yorkshire Agricultural Show.

Thursday, 14th July

ASCOT.—Berkshire Golf Club. Electrical Industries National Golf Championship, Lodon area meeting.

Thursday, 14th July, to Wednesday, 20th July

MANCHESTER.—College of Technology. Institute of Electronics (Northern Division). Tenth annual Electronics Exhibition.

Financial Section

STOCKS and SHARES

CONDITIONS in the industrial markets of the Stock Exchange at the start of this month have seemed sober in comparison with the spate of activity which rushed prices upwards throughout most of June. At the moment, the disposition seems to be to compare the yields of 4¼ per cent or so, obtainable from some of the British Government stocks, with the return of, say, 4 per cent down to as little as the 3 per cent shown by various industrial favourites. Some observers wonder whether this does not take rather too much for granted about the future prospects. The return to caution was encouraged by the Chancellor's latest review of economic affairs. Babcock & Wilcox advanced upon news of the company's securing a large contract for steam-raising plant for the new atomic power stations.

Thorn Electrical Issue

Thorn Electrical Industries are raising £1·8 million of fresh capital by a "rights" issue of new ordinary shares. The existing shares possess the uncommon distinction of having easily doubled their value in the first half of this year. Their holders are now offered one new 5s "A" share at 17s 6d for every two held. Dealings started at the beginning of this week at a premium of 8s. Annual results of the company, announced last month, showed another big advance of earnings, and an increase in the dividend from the equivalent of 10 to 15 per cent. Maintenance of that rate on the increased capital is expected. That the last payment involves the distribution of less than one-sixth of the net surplus is no doubt a factor in the quotation of the shares, at 25s, on a prospective yield basis of 3 per cent.

Walsall Conduits

Although the Walsall Conduits ordinary dividend is being kept at a total of 70 per cent, as announced last month, the 4s shares have been a rising market on the strength of the proposal for a three-for-one scrip issue, and of the chairman's review of affairs in the full report now issued. Sales in the first five months of this year are described as being well above last year's comparable figures, and the order book is stated to be full. Regarding the effects of the capitalization proposal, the chairman mentions that the equivalent of the current rate of dividend would be 17½ per cent on the ordinary capital so increased, and that it is the board's intention (subject to trading results) to recommend dividends of at least as much as that. Now 66s 3d, the 4s shares have risen about 15s in the past month and show a prospective yield of not less than 4¼ per cent.

Hackbridge & Hewittic

The 5s ordinary shares of Hackbridge & Hewittic have been a good

The Week's Price Changes

Company or Board	Nom. Value	Middle price 4th July	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1955 Highest	1955 Lowest
Gilt-edged Stocks								
Brit. Elec. 1968/73	100	83⅛	−1	3	3	3 11 9	94⅛	83⅛
Brit. Elec. 1974/77	100	83⅛		3	3	3 11 9	93⅛	83⅛
Brit. Elec. 1976/79	100	87⅛	−1	3½	3½	4 0 0	98⅛	87⅛
Brit. Elec. 1974/79	100	100½		4¼	4¼	4 4 6	109	99½
Overseas Electric Supply								
Calcutta Elec.	£1	21/6		6†	6†	5 11 8†	22/6	20/9
East African Power	£1	22/6		7	7	6 4 6	23/3	19/9
Nigerian Elec.	£1	23/6		10	10	8 10 3	27/-	22/6
Palestine Elec. "A"	£1	21/-		Nil	Nil	—	22/9	21/-
Perak Hydro-Elec.	£1	19/-	+6d	6	10	10 10 6	21/-	17/9
Equipment and Manufacturing								
Aberdare Cables	5/-	14/6		12½	17½	6 0 9	14/6	11/-
Aerialite	1/-	5/9		88⅛	88⅛	—	6/7	5/3
Allen, W. H.	£1	83/9		20	20	4 15 6	83/9	77/-
Aron Elec. Ord.	£1	61/3		20	15	4 18 0	63/9	55/6
Assoc. Elec. Ord.	£1	86/3		11½	14	3 5 1	89/-	65/3
Automatic Tel. & El.	£1	77/-		15	15	3 18 0	79/6	69/-
Babcock & Wilcox	£1	95/-	+3/-	12*	15	3 3 2	98/-	68/6
Baldwin, H. J.	2/-	5/3	−3d	20	20	7 12 6	5/6	4/4
Bakelite	10/-	33/6		12½	16	4 15 6	33/6	27/-
British Aluminium	£1	50/6	−1/-	10	12	4 15 0	52/-	35/3
B.I. Callender's	£1	53/6	+6d	10	10	3 14 9	55/3	44/9
B.I. Callender's 6% Pref.	£1	23/6		6	6	5 2 3	26/6	23/6
British Thermostat	5/-	33/9		27½	27½*	4 1 6	33/9	22/6
British Vac. Cleaner	5/-	9/-		25	30	—	9/-	7/-
Brook Motors	10/-	45/-		20	20*	—	45/-	39/9
Brush Ord.	5/-	9/6		6	10	5 5 3	9/6	7/7
Bulgin, A. F.	1/-	8/-	+6d	30	45	5 12 6	8/-	4/-
Burco	5/-	18/9		35	25*	6 13 3	23/-	18/9
Chloride El. Storage "A"	£1	75/-	−1/3	12½	17½	4 13 3	76/3	58/6
Clarke Chapman	£1	102/6		20	20*	3 18 1	102/6	68/9
Cole, E. K.	5/-	22/6	−1/-	27½	17½*	3 17 9	24/9	18/3
Cossor, A. C.	5/-	12/3	+2/-	10	10	4 1 9	12/3	8/9
Crabtree	10/-	32/6		17½	20	6 3 0	34/6	29/3
Crompton Parkinson Ord.	5/-	19/-		20	20	—	19/9	16/-
De La Rue	5/-	23/-	−9d	20	30	6 10 6	26/-	18/9
Decca	4/-	44/3	−6d	35	56¼*	—	45/6	31/-
Desoutter	5/-	32/6		20	25	3 17 0	32/6	25/6
Dewhurst	2/-	9/9		19	24	4 18 3	10/-	7/3
Dictograph Tel.	2/-	7/3		20	20	5 10 3	7/6	6/6
Dubilier Condenser	1/-	5/6		25	25	—	5/7	3/10
E.M.I.	10/-	31/-	−2/-	8	10	3 4 6	37/-	25/3
Electrical Components	5/-	18/9	+1/9	20	20	5 6 8	18/9	15/3
Elec. Construction	£1	37/6		15	8⅛*	4 10 8	41/3	31/6
Enfield Cable Ord.	£1	21/-		Nil	Nil	Nil	25/3	20/-
English Electric	£1	75/-		10	12½	3 6 9	77/9	54/3
English Electric 3½% Pref.	£1	14/9	−6d	3½	3½	5 1 9	16/9	14/9
Ericsson Tel.	5/-	45/-	−1/-	25†	20†*	2 4 6†	46/6	29/-
Ever Ready	5/-	33/6	+6d	40	35*	5 4 6	33/6	22/3
Falk Stadelmann	£1	52/6		15	15	5 14 3	52/6	43/9
G.E.C. Ord.	£1	65/-	−1/3	11½	12½	3 17 0	67/9	51/3
G.E.C. 6⅛% Pref.	£1	25/-	−1/3	6⅛	6⅛	5 4 0	28/4	23/6
General Cables	5/-	15/9		30	30	9 10 6	17/-	15/9
Greenwood & Batley	£1	56/9		17½	17½	6 3 3	57/-	54/6
Hackbridge Cable	5/-	17/3		20	20	5 16 0	17/9	14/-
Hackbridge & Hewittic	5/-	32/6	+2/6	25	30	4 11 9	32/6	23/9
Hall Tel. Acc.	10/-	18/9		10	10	5 6 8	18/9	11/-
Heatrae	2/-	5/3		12½	15	5 14 3	5/9	4/3
Henley's	10/-	20/6		10½	10½	5 2 6	21/-	17/-
Holophane	5/-	17/6		20	25	7 2 9	19/9	16/-

* After scrip issue. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

market since the declaration of the final dividend and the new capital proposals. Like the interim, the final distribution is being raised by 2½ per cent. It makes for the year a 30 per cent total, which is shown by the preliminary figures to come from earnings equivalent to over 70 per cent on the £500,000 ordinary capital. After improving to 32s 6d the shares are on a yield basis of a little under 4¾ per cent. For every ten existing shares, holders are to be offered four new shares free, through a capitalization of reserves, and one for cash at 12s 6d by way of "rights."

in Electrical Investments

Company or Board	Nom. Value	Middle price 4th July	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1955 Highest	1955 Lowest
Equipment and Manufacturing—continued.						£ s d		
Hoover	5/-	48/-	−1/-	45	70	7 5 9	52/6	40/-
I.C.I.	£1	57/-	−1/-	15	10°	3 10 3	61/9	38/3
Intl. Combustion	5/-	24/-		20	25	—	24/6	16/3
Johnson & Phillips	£1	45/-	−9d	15	15	6 13 4	52/6	45/-
Lancashire Dynamo	£1	53/9		14	15	—	55/3	37/3
Laurence, Scott	5/-	19/6		20	12½°	3 4 0	19/6	14/6
Lister, R. A.	£1	39/3	+6d	12	9·3°	4 14 9	39/3	30/6
London Elec. Wire	£1	60/-		10	12½	4 3 3	61/-	50/6
Lucas, J.	£1	49/6	−6d	10·8	7½°	3 0 6	50/6	41/6
Marryat & Scott	2/-	13/-		25	30	4 12 3	13/-	9/6
Mather & Platt	£1	68/6		15	13·4°	3 18 3	68/6	48/-
Metal Industries	£1	34/-	−6d	12	9	5 6 0	38/-	30/-
Midland Elec. Mfg.	£1	52/6		15	10°	3 16 2	51/3	44/-
Morphy-Richards	4/-	33/9		40	35°	4 3 0	35/-	27/-
Murex	£1	57/6	−6d	15	15	5 4 4	58/-	49/3
Newman Ind.	2/-	2/9		10	10	7 5 6	3/6	2/4
Oldham & Son	1/-	4/-		17½	17½	4 7 6	4/-	2/10
Parnall (Yate)	5/-	11/-		8	14	6 7 3	13/2	7/3
Parsons, C. A.	£1	91/3	+1/3	7½	10	2 3 9	100/-	56/-
Plessey	10/-	79/6	−6d	30	20°	2 10 3	81/9	57/6
Pye Deferred	5/-	39/6	−6d	20	20°	2 10 9	40/6	28/6
Revo	10/-	15/6		27½	9°	5 16 3	15/6	12/6
Reyrolle	£1	120/-		13¾	15	2 10 0	126/-	89/-
Rheostatic	4/-	14/3	+1/-	20	22½	—	14/3	9/3
Richardsons Westgarth	5/-	16/-	−9d	15	15°	4 13 9	16/9	11/-
Scottish Cables	4/-	19/6	−3d	27½	27½	5 12 9	22/6	19/3
Smith (England), S.	4/-	19/-		15	17½	3 13 9	20/-	15/-
Southern Areas	£1	33/-	+2/-	7½	10	6 1 3	34/9	27/6
Strand Elec.	5/-	10/3		17½	17½	8 10 9	10/3	8/6
Sturtevant	5/-	35/6		18·9	14·4†°	2 0 9†	35/9	21/-
Sun. Elec.	£1	35/-	+1/3	15	15	8 11 6	35/-	33/9
Switchgear & Cowans	5/-	17/-		10	20	5 17 9	17/-	11/-
Taylor Tunnicliff	5/-	14/9		12½	15	5 1 9	14/9	11/3
T.C.C.	10/-	48/9		30	25°	5 2 6	48/9	41/-
T.C. & M.	£1	38/6		8½	8½	4 8 3	40/9	35/-
Telephone Mfg.	5/-	10/6		10	10	4 15 3	10/6	9/3
Thorn Elec.	5/-	25/-x.r.		20	15°	—	33/-	13/9
Thornycroft	£1	43/9	−1/3	15	15	—	45/-	34/6
Tube Investments	£1	95/-	−2/6	15	17½	3 13 9	98/6	72/6
Vactric	5/-	18/9		10	15°	4 0 0	20/-	12/-
Veritys	5/-	9/3	+6d	12½	12½	6 15 3	9/3	7/-
Walsall Conduits	4/-	66/3	+5/-	70	70	4 4 6	66/3	50/-
Ward & Goldstone	5/-	42/6	−1/3	50	30°	3 10 6	45/-	37/6
Watford	2/-	8/9	+6d	22½	25	5 14 3	8/9	6/3
Westinghouse Brake	£1	110/-		16	18	3 5 6	110/-	82/-
West, Allen	5/-	16/6		17½	15°	4 11 0	16/6	8/-
Wolf Electric	5/-	20/6		17½	20	4 17 6	20/6	16/1
Trusts, Transport and Communications								
Anglo-Am Tel.:								
A. Ord.	100	75½		6	6	7 19 0	88	75½
Ord.	100	50		3¾	3¾	7 17 6	54½	50/-
Anglo-Portuguese	£1	25/-		8	8	6 8 0	25/-	21/-
Brit. Elec. Traction:								
Def. Ord.	5/-	23/-	+1/3	50	22½°	4 17 9	24/3	19/6
Cable & Wireless:								
Ord.	£1	53/-		9	10	3 15 6	54/-	39/6
4% Loan	100	95½		4	4	4 3 9	100	92
Calcutta Trams	£1	22/6		2½†	6†	5 6 8†	25/-	20/-
Cape Elec. Trams	£1	18/-		5½	7½	8 6 8	18/-	16/6
Marconi Marine	£1	40/-		10	10	5 0 0	40/-	33/-
Oriental Tel. Ord.	£1	83/9x.c.		16	16	—	102/6	96/6
Telephone Props.	£1	96/3	+5/-	—	20	4 3 0	96/3	80/6
Telephone Rentals	5/-	13/6		10	12½	4 12 6	13/6	9/6

Cossor Shares

Having taken a comparatively quiet part in last month's active advance of radio share prices, A. C. Cossor 5s shares became prominent last week with a jump of 2s to 12s 3d. The financial year of the company ended last March, and, if precedent is followed, the dividend and results will be known about the end of next month. Ordinary shareholders have received dividends of 10 per cent for each of the three years since dividends were resumed in 1952. Last year a useful increase in profits was reported, despite a large excess profits levy charge; the net surplus of just under £100,000 represented earnings of 15 per cent on the ordinary capital.

Lancashire Dynamo Preference

The new 5½ per cent preference shares issued recently by Lancashire Dynamo Holdings are available at around 21s to yield 5¼ per cent. They are at present 5s paid, with a call of 15s due on 27th July, until when a buyer is saved the expense of the 2 per cent transfer stamp duty, representing about 5d per share. Dividends on the preference capital are calculated to be covered about twelve times over by average profits of the past five years, and are due to be paid on 1st March and September.

Bagdad Power

The £1 shares of Bagdad Light & Power have jumped from about 70s to 86s since the company's announcement concerning the transfer of the undertaking to the Iraq Government against payment of £2·4 million. Other sums are payable in addition, but because the position is affected by tax problems involving substantial amounts, the board finds it impossible at present to compute the figure which may become available for distribution. Market estimates put the final net "break-up" value of the shares at around the £5 mark. These calculations do not pretend to be anything but highly provisional and unreliable.

Company Results

Revo Electric 10s shares were firm at 15s 6d following the declaration of a final dividend which again makes 9 per cent for the year, and of a recovery in the net profit from £49,000 to £89,000. This provides one-and-a-half times cover for the ordinary distribution, which was not quite fully earned in the difficult conditions of the previous year. Yield on the shares is about 5¾ per cent. Reliance Clifton Cables report no great change in the level of the net taxed profit for 1954, and is again raising the ordinary distribution, from the equivalent of 20 to 22½ per cent. With the 5s shares quoted at 24s the yield on the larger ordinary payment is 4¾ per cent.

REPORTS and DIVIDENDS

Walsall Conduits, Ltd.—The main figures in the accounts for 1954 were given in our last issue. In his circulated statement, Mr. A. E. Read (chairman) says that in his remarks last year he indicated that reorganization in production methods had enabled them to absorb additional production costs without any increase in selling prices, but there is a limit to what can be achieved in this direction. Production costs continue to rise and recently they have been obliged to make a moderate advance in selling prices. Output in 1954 again reached record figures, being 15 per cent higher than in 1953, although the overall profit margin declined by approximately 2 per cent. Sales for the first five months of the current year are well above those for the same period of last year and they have a full order book. Export trade was about the same as last year, but efforts in this direction are still hampered by import restrictions and the shortage of steel supplies. With the exception of steel, the general flow of materials is now reasonably good, but the general shortage of suitable labour is a handicap to maximum production. During the year they acquired for cash the business of the Eureka Conduits & Fittings Co., and this has already resulted in a useful addition to their output.

An extraordinary general meeting is to be held on 22nd July at which proposals will be submitted to increase the authorized share capital to £1,000,000 by the creation of 2,500,000 additional ordinary shares of 4s each, and to capitalize £600,000 of the reserves by the allotment, credited as fully paid, to ordinary shareholders of 3,000,000 ordinary shares in the proportion of three new shares for every share held.

The Southern Areas Electric Corporation, Ltd.—The annual meeting was held on 29th June, when Lord Gridley (chairman), who presided, in the course of his speech said that they were now carrying out extensions to their factories at Merrow (Surrey) and Chalford (Glos.). Last year he mentioned that the works extensions at Dursley of the Mawdsley undertaking had been completed and in due course they would proceed with the reconstruction of the older portion of the factory. The Mawdsley subsidiary had had another satisfactory year and the P.A.M. undertaking at Merrow had a record year in both output and profits. The Ross Courtney factory at Upper Holloway also had a good year and other subsidiaries also showed improved results over the previous year. The staff of Tyer & Co., the railway signal manufacturing subsidiary, were busily engaged on modernizing various types of railway signal apparatus in view of the large modernization plans and requirements of the British Transport Commission, in which they hoped to obtain a fair share of the orders to be placed. Lord Gridley mentioned that in order to relieve him of detailed managerial responsibilities, Mr. J. W. C. Milligan had been elected to the board and had been appointed executive managing director.

Ward & Goldstone, Ltd.—The financial results for the year to 31st March last were given in our last issue. In his statement which accompanies the report and accounts, Mr. S. Goldstone (chairman and managing director) says that production and sales during the year under review were the highest in the company's history, but profit margins have narrowed, due to increased cost of materials, keen competition, and the caprice of the commodity markets, mainly in regard to copper and rubber. The policy of expansion still continues and while so far they have been able to meet the capital requirements from their own resources, any further substantial development will give rise to the question of the need to raise additional capital.

The British Thermostat Co., Ltd.—The financial results for the year ended 31st January were given in our issue of 10th June.

In his circulated statement, Mr. J. E. Sherlock (chairman and managing director) says that the year under review provided yet another record in turnover and profit. It is proposed to deal with the problems of increasing costs and labour shortage by the installation of more automatic machines and processes, for which a substantial sum has already been earmarked, and by pursuing the policy of setting up independent units in districts where labour is available. A site has been purchased at Camberley and a lease taken on a factory at Ammanford, South Wales.

To deal with the problem of export they plan to set up more overseas units and to increase the activities of the French subsidiary company. A subsidiary has been established at Nieuwkoop, Holland, and tentative proposals have been discussed for setting up a company to exploit the range of Teddington products in New Zealand. Mr. Sherlock reviews the progress made by the various subsidiary companies.

Thorn Electrical Industries, Ltd., is to make an issue by way of "rights" of 2,137,500 "A" ordinary shares of 5s each to the holders of ordinary shares in the proportion of one new "A" ordinary share for every two ordinary shares held. The price will be 17s 6d per share. The "A" ordinary shares will not rank for dividend for the year ended 31st March last and will carry no voting rights but in all other respects will rank *pari passu* with the ordinary shares.

The Revo Electric Co., Ltd., reports that after providing £126,816 for taxation, the consolidated profit for the year ended 31st March last is £89,298, as compared with £48,904 for the previous year. It is proposed to pay a final dividend of 5½ per cent, maintaining the distribution for the year at 9 per cent.

Reliance-Clifton Cables & Industrial Products, Ltd.—The group profit for 1954 is £317,914, as compared with £308,612 for the preceding year, and the net result, after providing £141,242 for taxation, is £140,090 (against £143,552). It is proposed to pay a final dividend of 12½ per cent, making 22½ per cent for the year. For the preceding thirteen months the distribution was at the rate of 35 per cent per annum, equivalent to 20 per cent per annum on the capital increased by a scrip issue in April, 1954.

Morphy-Richards, Ltd., announce that of the issue of 153,090 ordinary shares of 4s each at 27s per share, 148,458 shares have been accepted by stockholders on provisional allotment letters. As applications from 700 stockholders for excess shares totalled over 192,000 shares the 4,632 shares available have been allotted as follows:—Applications for up to 5 shares in full; for 6 to 150 shares, 5 shares each; and over 150 shares, 10 shares each.

Drake & Gorham, Ltd.—The consolidated net profit for the year ended 31st March last, after providing £33,575 for taxation, is £29,215, as compared with £28,468 for the preceding year. The dividend for the year is unchanged at 7½ per cent.

The Radio & Television Trust, Ltd., announces that the date for the acceptance of the offer by Crompton Parkinson, Ltd., to purchase holdings of 6 per cent sinking fund certificates and 6 per cent cumulative redeemable preference stock has been extended from 30th June to 31st July.

New Companies

S. Korobuk, Ltd.—Registered 21st May. Capital £1,500. Manufacturers, exporters and importers of, agents for and dealers in tape and wire recording machines and apparatus, radio, television and electrical apparatus, etc. Directors: S. Korobuk, Iris M. D. Korobuk, E. A. Moore and Annie Korobuk. Regd. office: 126, Bishopsgate, E.C.2.

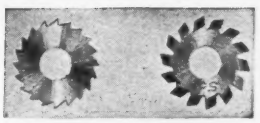
Wholesale Electric (Liverpool), Ltd.—Registered 20th May. Capital £4,000. To acquire all or any part of the assets of B. and Evelyn Cadwallader, trading in partnership as the Wholesale Electrical Equipment Co. at 63, Scotland Road, Liverpool, and 113, Eastbank Street, Southport,

(*Continued on page 95*)

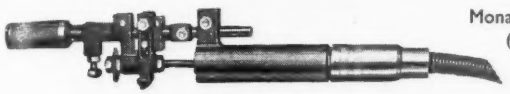
MARTINDALE

MICA UNDERCUTTING *System No. 2*

Quick, clean "U" or "V" undercutting of almost any size or type of commutator can be effected with the aid of power milling tools as illustrated.

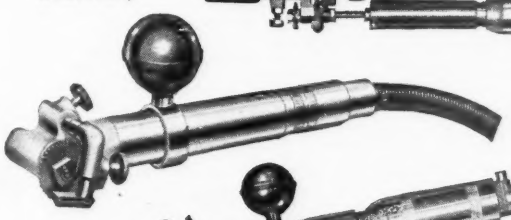


Undercutting Saw — Undercutting "V" Cutter



Monarch Undercutter (Flex-Drive)

Monarch Undercutter (Pneumatic)

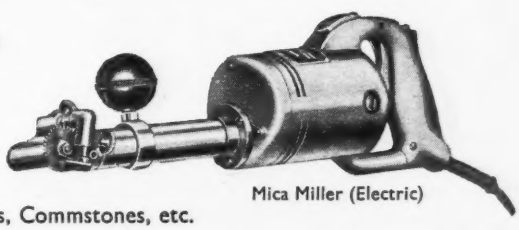


Mica Miller (Flex-Drive)

Mica Miller (Pneumatic)

With small saws or "V" cutters slots can be cut almost to the risers and only in special cases is it necessary to complete the cuts by file.

The milling heads are interchangeable with the oscillating heads of the Mica Slotters used in the Martindale System No. 1.



Mica Miller (Electric)

Write for details of other Martindale Undercutters, Fault Finders, Commstones, etc.

also at
25 Elmbank Street, Glasgow, C.2

MARTINDALE ELECTRIC CO. LTD.
4 WESTMORLAND ROAD, LONDON, N.W.9

LEGG INDUSTRIES LIMITED

Legg Industries Limited design and manufacture Charging Equipment for Electric Vehicles and Trucks of all types and the majority of leading manufacturers specify LEGG CHARGERS for use with their equipment—both at Home and Abroad.

WHEN YOU PURCHASE A LEGG CHARGER YOU ENSURE YEARS OF RELIABLE SERVICE

Chargers are also designed and manufactured to comply with C.S.A. requirements.

Legg **VEHICLE CHARGERS**

LEGG (INDUSTRIES) LTD.
WILLIAMSON ST., WOLVERHAMPTON

5723D

One [or more] of these leaflets is for YOU...

These three leaflets fully describe the wide range of standard DALY electrolytic capacitors. In general, the types listed will cover most requirements. Where specifications outside this range must be met, however, DALY will design and make special units to meet specific needs.

Behind DALY capacitors there lies 20 years of making only electrolytics, highly specialised experience which engineers throughout the world are finding invaluable, and which is readily available to you.

We shall be happy to send you copies of these leaflets without obligation.

DALY
ELECTROLYTIC CAPACITORS

CONDENSER SPECIALISTS FOR OVER 20 YEARS

DALY (CONDENSERS) LTD. WEST LODGE WORKS, THE GREEN, EALING, LONDON, W.5 *Phone: EALing 3127-8-9. Cables: DALYCON, LONDON*

---

5 Years Testing Proves Stemless Thermostat

"Rubicon" IMMERSION HEATER with ADJUSTABLE THERMOSTAT RANGE 100°-180°

- HEAD CLEARANCE ONLY 1¾"
- VERTICAL or HORIZONTAL MOUNTING
- SOLID EMBEDDED ELEMENTS
- FLASH TESTED TO 2000 VOLTS

MODEL 'PN'

CONTROLLED HEATING UNITS (LONDON) LTD.
· AVENUE ROAD · HAMPTON · MIDDX ·
TELEPHONE: MOLESEY - 3287

Reports and Dividends (*continued*)

and to carry on the business of wholesale distributors of and agents for cable, switchgear and electrical equipment of all kinds, manufacturers of and dealers in radio receiving sets, television apparatus, etc. Directors: B. Cadwallader and Evelyn Cadwallader. Regd. office: 63, Scotland Road, Liverpool, 3.

Lawton & Carter, Ltd.—Registered 13th June. Capital £1,000. Electrical engineers, etc. Directors: W. S. Lawton and R. Carter. Regd. office: 413, Turnhurst Road, Packmoor, Stoke-on-Trent.

C.A.E. (Chingford), Ltd.—Registered 11th June. Capital £100. Electricians, mechanical engineers, etc. The first directors are to be appointed by the subscribers. Solicitors: Carters, 2, Swallow Place, Oxford Circus, W.1.

Winding-up Petition

C. Saunders & Co. (Electrical Contractors), Ltd.—A petition for the winding up of the company is to be heard at Lincoln County Court on 19th July. Notice of intention to appear on the hearing must be sent to Langley, Phillips & Coleman, 34, Silver Street, Lincoln, agents for the solicitors for the petitioner, by 18th July.

Liquidations

J. R. Morgan (Brighton), Ltd., manufacturers and dealers in electrical and radio apparatus.—At an extraordinary meeting held on 21st June it was resolved, it having been proved that the company could pay its debts in full, that it should enter into a members' voluntary winding-up, with Mr. W. A. Sutherland, of Hilton, Sharp & Clarke, 13, Ship Street, Brighton, 1, as liquidator. Particulars of claims to the liquidator by 30th July.

County Electronics, Ltd. (in voluntary liquidation).—Meetings of creditors on 29th July at the board room of Harry L. Price & Co., 47, Mosley Street, Manchester, 2, to receive an account of the winding up by the liquidator, Mr. A. T. Eaves.

A. G. Wireless & Electrical Co., Ltd. (members' voluntary winding up).—Meeting of members 18th July at Adelaide House, London Bridge, E.C.4, to receive an account of the winding-up by the liquidator, Mr. D. R. Clack.

Bankruptcies

H. Pryor, carrying on business as W. Pryor at 36, Low Hill, Liverpool, 6, electronic engineer.—Last day for receiving proofs for dividend 8th July. Trustee, Mr. S. O. Henry, 5, Rumford Place, Liverpool, 3.

H. S. Page, 109, Market Street, Westhoughton, Lancs, radio, electrical and toy retailer.—First dividend of 1s 6d in the £, payable at the offices of the trustee, 47, Mosley Street, Manchester, 2.

Australian Cable Tariff Decision

The Australian Tariff Board has issued its report on the cable industry. According to the Melbourne Correspondent of the *Financial Times* the Board's recommendation for the imposition of a British preferential duty of 10 per cent on certain types of covered cable and covered wire, formerly admitted duty-free, has been approved by Parliament and is now in force. Intermediate and general rates were raised from 12·5 to 22·5 per cent.

Witnesses at the Board's inquiry had alleged that selective shading of export prices by margins up to 12·5 per cent below domestic prices was taking place. The Board said that confidential information supplied on behalf of U.K. Sterling Cable—against which allegations were made—showed that in each instance the current domestic value in the United Kingdom was the same as the current f.o.b. price.

In recommending a British preferential duty of 10 per cent, the Board limited its application to items designed for use at working voltages not exceeding 11,000, leaving high-voltage cables and thermocouple, compensating or extension leads on the duty-free list.

Four major Australian firms, who applied for protection, share about half of the £A10 million market for cables covered by the tariff clause under review. They asked for the imposition of a British preferential duty of at least 17·5 per cent, with the exception of one company which specified no figure.

In its survey of the Australian cable industry the Board found that excess capacity existed, which would not be filled even if there were no imports of the classes of cables that are made in Australia. It suggested that Australian cable makers might have to consider some scheme of rationalization if demand fell short of estimated needs for high-voltage cable.

The limited information before the Board on comparative costs in the United Kingdom and Australia indicated that price differentials for paper and rubber insulated metal sheathed cables up to 22 kV working pressures would be bridged by duties carrying from nil to 24 per cent *ad valorem*. Less protection would be required for cables in the 240 V range, principally because of greater output and more constant demand, however, but the Board decided not to differentiate but to impose an overall duty at a relatively low rate, leaving the industry to achieve the best results under that level.

Although it considered the local industry was an important one, measured by United Kingdom standards of sales, volume, and range of output, the Board said that Australian manufacturers operating at the highest level of efficiency would be unlikely to produce at costs as low as those in the United Kingdom. Higher wages, higher costs of some materials, shorter runs and high costs of distribution were the main factors. The burden of overheads had been increased because the majority of Australian plants were not operating at full capacity.

However, as materials represented about 70 per cent of the total cost of finished goods the Board considered that the requested duty of 17·5 per cent represented a protection of about 60 per cent on costs of fabrication.

The Board went on to add this word of caution: "The report of the Monopolies and Restrictive Practices Commission in the United Kingdom on the practices of the Cable Makers' Association and associated organizations in that country does not inspire confidence that the practices condemned by the Commission will not be employed in Australia. Effective competition is necessary to safeguard the public, and the Board is not convinced that over the whole field this can be supplied by the main Australian manufacturers independent of the Cable Makers' Association."

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 15th July:—

ELNOR (design). No. 725,206, Class 7. Electric motors (not for land vehicles), generators, and parts.—Constructions Electriques du Nord de la Belgique en Abrege Elnor, Wespelaar, Belgium. Address for service, c/o Marks & Clerk, 57 & 58, Lincoln's Inn Fields, London, W.C.2.

ROADMASTER. No. 734,610, Class 9. Fittings for use with electric starter batteries; battery chargers; cable sets for internal combustion engine ignition systems; switches for vehicle starting devices; and armatures and field coils.—Walker-Tyseley (Electrical), Ltd., 264, Kings Road, Tyseley, Birmingham, 11.

VULKOLLAN. No. 736,707, Class 9. Electrical apparatus and instruments; radio, scientific, measuring, signalling, checking (supervision), life saving and teaching apparatus,, etc.—Farbenfabrieken Bayer Akt.-Ges., Leverkusen, Germany. Address for service, c/o Carpmaels & Ransford, 24, Southampton Buildings, Chancery Lane, London, W.C.2.

ELECTROCOM. No. B739,077, Class 9. Telephone instruments and apparatus for use in, and being parts of, internal communication systems.—Modern Automatic Telephones, Ltd., Telesound House, 101, Tottenham Court Road, London, W.1.

ISOLECTOR. No. 740,493, Class 9. Electric circuit breakers.—English Electric Co., Ltd., Queen's House, Kingsway, London, W.C.2.

MITHRAS. No. 736,971, Class 11. Electrical lighting installations and parts, but not including lamp globes or any goods of the same description as lamp globes.—Soho Electrical Services, Ltd., 6, Soho Street, London, W.1.

BOARDETTE. No. 739,072, Class 11. Gas heated and electrically heated cupboards.—James Stott & Co. (Engineers), Ltd., Vernon Works, Lee Street, Oldham, Lancs.

PYRAD. No. 740,086, Class 11. Installations and apparatus all for heating.—Pyrad Electric, Ltd., Imperial Court, Basil Street, Knightsbridge, London, S.W.3.

GENERATION AND DEVELOPMENT

New Collier Launched

The s.s. *Charles H. Merz*, built by Hall, Russell & Co., Ltd., Aberdeen, for the Central Electricity Authority (managers, Stephenson Clarke, Ltd.), was launched on 23rd June at Aberdeen, the naming ceremony being performed by Mrs. C. H. Merz. Intended for trading to the new Shoreham Harbour and the lower reaches of the River Thames, the *Charles H. Merz* is a single-screw, self-trimming collier of about 3,700 tons deadweight with raised quarter deck.

South Wales Commercial Tariffs

The South Wales Electricity Board has published two revisions of its commercial tariffs. The first concerns the commercial block rate tariff under which it is proposed to exclude from assessment the floors of any outbuilding, or any part of an outbuilding, not used for commercial purposes. Outbuildings were formerly assessable in the same way as the main premises and the revision now announced will meet difficulties which have been experienced in cases such as old licensed houses which include extensive outbuildings, often no longer put to commercial use.

The other revision makes the commercial maximum demand tariff available to commercial consumers with maximum demands of 5 kW and upwards. Formerly this tariff was available only to consumers with maximum demands of 20 kW or more.

Assisted Wiring

The Housing Committee of the Association of Municipal Corporations has decided to support a move for legislation dealing with faulty electrical wiring in homes. This follows reports received by the Metropolitan Boroughs Standing Joint Committee of difficulties experienced by occupiers of houses in which the electrical wiring had been found defective. In cases where the landlord refused to undertake the necessary re-wiring, the tenant was faced with either a large bill or no electricity supply. The Standing Joint Committee is now seeking legislation which would enable Electricity Boards to start assisted wiring schemes on the lines of schemes formerly operated by Councils who owned electricity undertakings.

A report from the Association of Municipal Corporations says: "In our opinion, each of the Electricity Boards should introduce assisted wiring schemes. We are making representations accordingly to the Ministry of Housing and Local Government and the Ministry of Fuel and Power."

The County Councils' Association, although declining to support the move, say it is in sympathy with its objects.

Durham Miners and Atomic Power

The Ministry of Fuel and Power is being asked by the Durham Area of the National Union of Mineworkers to build an atomic energy plant in County Durham. Mr. S. Watson, secretary, said that Durham's resources of coal were declining, and he considered that West Durham was a suitable place to build an atomic plant as an alternative source of power and as a means of providing additional employment in the county.

Canterbury Festival

Extensive floodlighting is being provided for the Canterbury Festival from 25th July to 5th August. The places to be illuminated include the Cathedral, Christchurch gateway, the city walls, the gateway to St. Augustine's Abbey, Mercery Lane leading to the Cathedral, Westgate and the Weavers.

Supply to Holy Island

The South of Scotland Electricity Board has approved a scheme to give a supply of electricity to Holy Island, which lies off the north-east coast of Northumberland. The island, well-known on account of its historical connections, is now a popular holiday resort. There are 106 premises, including 75 houses, seven hotels, twelve boarding houses and one farm. Some 1,320 yd of 11 kV overhead line will be erected from a point on the mainland near Beal and three miles of submarine cable will be laid between the mainland and the island. From the termination of the cable a short section of 11 kV overhead line will be run to the village, where a transformer station will be erected.

H.V. Cable

The North Eastern Electricity Board is improving the electricity supply in the South Tyne Valley by the construction of a 20 kV cable along the south bank of the Tyne from Haydon Bridge to Haltwhistle. Many farms and houses in the district will receive their first electricity supplies. For a considerable time there have been complaints about the quality of the supply in the Haltwhistle district.

Progress at Roxburgh

After suffering from a number of setbacks in the early stages of construction, the New Zealand Government's Roxburgh hydro-electric development—the largest yet undertaken—is now making rapid progress. The official date for initial operation is the end of next year, but there is a chance that some power may be available in the middle of the year, in time to help to meet the winter peak loads. The difficult task of diverting the Clutha River was completed in July, 1954, and the half-way stage in the construction of the dam and power house has now been passed. Unlike some other major power schemes in New Zealand, Roxburgh will not be provided with a conventional spillway. The diversion channel, which is now carrying the full flow of the river, will have steel doors in its three sections to permit the release of water when the river flow threatens to rise above the top of the dam. The station will eventually house eight 40,000 kW sets.

The Roxburgh hydro-electric development in the South Island of New Zealand

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—14th September. State Electricity Commission of Queensland. 132 kV overhead transmission line. (E.S.B. 13922/55. Ten/14440.)*

Durham.—19th July. County Council. Electrical installation in Dinsdale Park Residential School. (See this issue.)

Ecuador.—16th July. Municipality of Otovalo. 500 kVA hydro-electric plant. (E.S.B. 13940/55. Ten/14424.)*

Edinburgh.—North of Scotland Hydro-Electric Board. Electrical installation in Nairn substation; 132 kV steel tower overhead lines for Aberdeen. (See this issue.)

Ely.—16th July. U.D.C. Electrical installations in 27 houses. Surveyor, Council Offices.

Hastings.—23rd July. Borough Council. Electrical installations in secondary modern school extensions, Red Lake. Borough surveyor, 37, Wellington Square.

Ince-in-Makerfield.—23rd July. U.D.C. Electrical installations in 20 houses on the Battersby Street site. J. P. Ogden, surveyor, Town Hall.

India.—25th July. Damodar Valley Corporation. 132 kV power line carrier equipment. (E.S.B. 13498/55. Ten/14362.)* 5th August. 33 kV cables and accessories. (E.S.B. 13499/55. Ten/14358.)* 8th August. Instrument transformers. (E.S.B. 13500/55. Ten/14360.)*

25th July. Government of Mysore, Stores Purchase Committee. Battery equipment with motor-generator sets, etc. (E.S.B. 13730/55. Ten/14395.)*

31st July. Director General of Supplies and Disposals, New Delhi. Power supply transformers. (E.S.B. 14006/55. Ten/14454.)*

1st August. Government of Madras, Department of Electricity. 24,120 house service meters. (E.S.B. 14158/55. Ten/14452.)*

1st August. General Superintendent, Lignite Investigation, Neyveli. Two 1,500 kVA auto-transformers. (E.S.B. 13771/55. Ten/14384.)*

8th August. Bombay Port Trust. Electrical equipment in substations, Victoria Dock, and underground cables. (E.S.B. 13782/55. Ten/14394.)*

Iraq.—20th September. Directorate General of Municipalities, Baghdad. One 500 kW and two 250 kW generating sets, two 1,500 kVA transformers and switchgear for Kut. (E.S.B. 13761/55. Ten/14432.)*

Lichfield.—23rd July. City Council. Street lighting equipment. (See this issue.)

Llwchwr (Glam).—26th July. U.D.C. Street lighting equipment. (See this issue.)

London.—15th July. S.E. Metropolitan Regional Hospital Board. Electrical installation in outpatients' unit at Lewisham Hospital. (See this issue.)

Longbenton.—22nd July. U.D.C. Electrical installations in 30 houses at Fordley, (See this issue.)

Merton and Morden.—21st July. U.D.C. Street lighting equipment. (See this issue.)

Pakistan.—25th July. Purchase Co-ordinating Officer, General Posts and Telegraph Department, Karachi. Cables and accessories. (E.S.B. 13659/55. Ten/14390.)*

Peterborough.—20th July. Joint Education Board. Electrical installation in secondary modern school for girls. (See this issue.)

Rowley Regis.—18th July. Borough Council. Street lighting equipment. S. G. Wood, borough surveyor, Municipal Buildings, Old Hill, Staffs.

South Africa.—27th July. Stores Department, South African Railways. Underground armoured cable. (E.S.B. 13932/55. Ten/14417.)* 29th July. Telephone cable. (E.S.B. 13933/55. Ten/14418.)* Overhead track equipment. (E.S.B. 13904/55. Ten/14438.)*

Southend-on-Sea.—18th July. County Borough. Electrical installation in Westcliff High School for Girls. (See this issue.)

Stocksbridge.—18th July. U.D.C. Amendment. Street lighting equipment. (See this issue.)

Uruguay.—8th August. Ministerio de Salud Publica. Laboratory equipment including electrical agitators, time switches, heaters, etc. (E.S.B. 13280/55. Ten/14356.)*

West Hartlepool.—Borough Corporation. Electrical work in connection with proposed additions to Rift House Primary School. A. G. Sinclair, borough architect, Municipal Buildings.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Carlisle.—City Council. Electrical installations in 54 houses on the Harraby housing estate, Carlisle.—Hartley Electromotives.

Chester. — Corporation. Recommended. Electrical installation at College of Further Education (£10,207).—Engineering Service Installations.

Leeds.—City Council. Recommended. Electrical installations in 130 dwellings at the Seacroft (Swarcliffe) estate (£2,867); 160 dwellings at the Silver Royd and Tong Road estates (£3,519); 92 dwellings at Belle Isle and Fearnville House estates (£1,889) and 112 dwellings on the Seacroft (Beechwood) estate (£2,395).—Vallance & Davison. Electrical installations in 448 multi-storey flats at Saxton Gardens (£19,453).—Albert Innes.

London.—Metropolitan Water Board Works and Stores Committee. 6-ton electrically operated overhead travelling crane, and removal of an existing crane at the Hampton works (£4,873).—Vaughan Crane Co.

Paddington Works Committee. Electric street lighting in the roads included in the street lighting conversion programme for the year 1955-56, together with the remainder of Blomfield Road (£14,686).—Concrete Utilities.

Northumberland.—Education Committee. Electrical installations in Morpeth King Edward VI Grammar School (£3,960).—A. Hagerty, Ashington.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Addington.—Factory; Carrington Manufacturing Co., Ltd., Camco Works, Sanderstead Road, South Croydon.

Bedford.—Municipal office block for Town Council (£180,000) and houses (54) on Putnoe estate; borough architect.

Belford.—Blocks of flats; R. Kirk, R.D.C. surveyor.

Beverley.—Extensions and alterations at Westwood Hospital; Gelder & Kitchen, architects, 120, Alfred Gelder Street, Hull.

Birmingham.—Two blocks (40 beds each), admission unit (140 beds), and new outpatient clinic attached, near Rubery Hill, and proposed unit (100 beds), for Hollymoor; Birmingham Regional Hospital Board, 10, Augustus Road, Edgbaston, 15.

Bishop Auckland.—Fire station; G. R. Clayton, county architect, Court Lane, Durham.

Bolton.—Television station, Winter Hill; Independent Television Authority, Woods Mews, Park Lane, London, W.1.

Bournemouth.—Multi-storey building for shops and offices, Christchurch-Holdenhurst Road site; Royal London Mutual Insurance Society, Royal London House, Finsbury Square, London, E.C.2.

Brentford.—Office block; Trico Folberth, Ltd., Great West Road.

Bristol.—Buildings on the Brislington Trading estate; Redcliffe Radio & Engineering Co., Ltd., 1, William Street, Totterdown, Bristol, 3.

Shop and showroom, Haymarket, for Singer Sewing Machine Co., Ltd.; Staverton Builders, Ltd., contractors, Totnes.

Bury.—Houses (80), on the Huntley Fold estate; J. Chadwick, borough surveyor, Bank Street.

Buxton.—Houses (50), on Victoria Park estate No. 3; A. C. W. Ryland, borough surveyor, Town Hall.

Carlisle.—Houses (214), Morton estate, for City Council; John Twiname, Ltd., builders, Brigham.

Cinema at Harraby for Rural Cinemas & Entertainments, Ltd.; John Laing & Sons, Ltd., Dalston Road.

Coventry.—Extensions to factory at Browns Lane, Allesley, for Jaguar Cars, Ltd.; W. H. Jones & Son, Ltd., Holbrook Lane.

Large printing and publishing works at Corporation Street for Coventry Newspapers, Ltd.; L. A. Culliford & Partners, architects, 47, Essex Street, London, W.C.2.

Crosby.—Houses on the Thornton estate (£143,300); J. R. Fothergill, borough surveyor, Town Hall, Waterloo, Liverpool, 22.

Cuckfield.—Development of large estate at Harlands Farm, Haywards Heath, to provide houses, public buildings, etc., for U.D.C.; R. J. Willett, surveyor, Oaklands, Haywards Heath.

Cumberland.—Clinic at Whitehaven for the C.C. (£10,000); county architect, 15, Portland Square, Carlisle.

Dagenham.—Clinic, Oxlow Lane; county architect, County Hall, Chelmsford.

Durham.—Community and youth centre at Hetton (£5,500); grammar-technical school, Mill Lane, Hebburn; infants' schools on the Ellen Wilkinson and Wardley estates, Felling; houses at Bishop Auckland and Crook; additions to Chester-le-Street library; and alterations to Elizabethville County School, Birtley (£4,000); county architect, Court Lane.

Eastwood (Notts).—Fire station; county architect, Nottingham.

Kimberley (Notts).—Factory for Wolsey, Ltd.; Cecil Howitt & Partners, architects, St. Andrews House, Mansfield Road, Nottingham.

Lancaster.—Houses (42), Ridge estate; R. M. Middleton, town clerk, Town Hall.

Leeds.—Buildings for University Technological Departments; Lanchester & Lodge, architects, 10, Woburn Square, London, W.C.1.

London.—Showrooms and offices, Aldgate and Jewry Street; Felix D. Fenston, 19, Hill Street, W.1.

Maidenhead.—Research laboratory and extensions; British Filters, Ltd., Cox Green Lane.

Extensions to factory blocks; Vandervell Products, Ltd., Cox Green Road.

Manchester.—Ice cream depot at Shentonfield Road, Northenden, for T. Wall & Sons, Ltd., London; Peter Hodkinson, Ltd., Devonshire Street, Ardwick.

Matlock.—Large shopping centre at Firs estate; J. W. Wildgoose & Sons, Ltd., Industrial Works.

Middlesbrough.—Theatre for the Little Theatre Committee; Elder & De Pierro, architects, 80, Wimpole Street, London, W.1.

Departmental stores for Dickson and Benson, Ltd.; Shepherd and Son, builders, Richmond, Yorks.

Morley.—Dwellings (486), Low Moor estate; E. V. Finnegan, town clerk, Town Hall.

Newburn - on - Tyne. — Houses (88) (£116,000); J. W. Weatherley, U.D.C. surveyor.

Northfleet.—Extensions to paper mills; Bowater Paper Corporation, Ltd., Bowater House, Stratton Street, London, W.1.

North Riding.—Assembly hall at Yarm Grammar School; county school architect, County Hall, Northallerton.

Nottingham.—Church of St. Edward; David E. Nye, architect, 7, Victoria Street, London, S.W.1.

Old Fletton.—Sub-divisional police station (£50,000); county architect, Huntingdon.

Oldham.—Proposed welfare centre and ante-natal clinic at Hollins (£8,800); Borough Surveyor's Department.

Peterborough.—Crematorium; J. P. Chaplin, architect, 4, Cathedral Close, Norwich.

Peterlee.—Health centre; county architect, Court Lane, Durham.

Poole.—Houses and flats (32), on the Alderney West estate; J. R. Barron, borough surveyor, Municipal Buildings.

Reading.—Factory, Commercial Road; Modern Vehicle Constructors, Ltd., 79, Northumberland Avenue.

Redditch.—First stage of works (£100,000); Super Oil Seals & Gaskets, Ltd., Factory Centre, Birmingham, 30.

Richmond (Yorks).—Houses (52), at Scorton; J. Powell, R.D.C. surveyor, 56, Market Place.

Rochford.—Houses (86), on the Rochford Garden estate; R.D.C. surveyor, Council Offices, 24, South Street.

Romford.—Flats (48), Oldchurch Park; J. Twinn, town clerk, Town Hall.

Royton (Lancs).—Houses (54), Flake Lane site, for U.D.C.; Heywood & Ogden, architects to Council, 12, Clegg Street, Oldham.

Rugby.—R.C. secondary school; Sandy & Norris, architects, 134, Newport Road, Stafford.

Ruislip.—Crematorium and staff houses, for Ruislip-Northwood and Uxbridge Crematorium Joint Committee; E. S. Saywell, clerk to Committee, Oaklands Gate, Northwood, Middlesex.

Scunthorpe.—Civic centre proposed at Ashby (£250,000); borough surveyor, Municipal Offices, 34, High Street.

Seisdon.—Houses (115) at Wombourn and Bilbrook for R.D.C.; W. Whittingham, Ltd., Ettingshall Road, Wolverhampton.

Sleaford.—First stage of county offices (£40,000); county architect, Sleaford, Lincs.

Smethwick.—Flats (610), on No. 2 redevelopment site, for Housing Committee; Roland Fletcher, borough surveyor, Council House.

Southampton.—Re-organization of X-ray Department, General Hospital; Gutteridge & Gutteridge, architects, 45, Westwood Road.

Shops (26), flats (42), etc., Inner Ring Road; borough architect.

South Shields.—Houses (95), Simonside and 35 in Jesmond Terrace; J. Reid, borough engineer.

Laboratory, X-ray department, etc., Ingham Infirmary (£25,000); Newcastle-on-Tyne Regional Hospital Board, Osborne Road, Newcastle.

Southwell (Notts).—Houses (58), for R.D.C.; surveyor, Council Offices, Westgate.

Staffordshire.—Secondary schools at Hixon and Gnosall; director of education, Green Hall, Lichfield Road, Stafford.

Stevenage.—Girls' grammar school at Ashtree Wood (£198,010); county architect, County Hall, Hertford.

Houses and flats (215), at Broom Barnes, for Development Corporation; chief engineer, Aston House.

Stockport.—Factory buildings for colour production; T. L. Gould, Ltd., colours and chemicals, Ford Street Mill, Brinksway.

Stourbridge.—Dwellings (44), at Wollaston Farm estate for T.C.; Nathan Hyde, 6, Claremont Road, Sedgley.

Sunderland.—Methodist church on the Red House estate; S. W. Milburn and Partners, architects, 9, Esplanade.

Tynemouth.—Health centre at Spring Terrace, North Shields; borough engineer, 16, Northumberland Square, North Shields.

Warwickshire.—Six schools at Atherstone (£132,000), Balsall Common (£128,000), Coleshill (£160,000), Keresley Newland (£171,000), Solihull (£120,000), and Stratford-on-Avon (£136,000), for E.C.; G. R. Barnsley, county architect, Shire Hall, Warwick.

Wilmslow (Cheshire).—Extensions at Dean Row for Cleggs, Ltd.; Reynolds & Scott, architects, 9, Albert Square, Manchester.

Yorks (North Riding).—County primary school at Colburn, Richmond, and primary school at Skelton; county architect, County Hall, Northallerton.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 0d each including postage) will be obtainable after 10th August from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1951

21301. Plessey Co., Ltd.—Remote control mechanism. 26th November, 1952. (734923.)

25525. Electrical & Musical Industries, Ltd.—Electrical phase discriminating or phase controlling circuits. 3rd November, 1952. (735020.)

26019. Simplex Electric Co., Ltd.—Container assemblies for storage heaters for liquids. 7th November, 1952. (734760.)

26020. Simplex Electric Co., Ltd.—Supporting devices for storage heaters for liquids. 7th November, 1952. (734761.)

28855. C.A.V., Ltd.—Apparatus for actuating a gas discharge lamp. 10th December, 1952. (735021.)

1952

1523. Naamlooze Vennootschap Philips' Gloeilampenfabrieken. — Stand-by electric supply apparatus. 18th January, 1952. (734926.)

2101. Western Electric Co., Inc.—Electron discharge devices employing travelling waves. 25th January, 1952. (734828.)

2102. Western Electric Co., Inc.—Wave transmission circuits for electron discharge devices. 25th January, 1952. (734771.)

5187. Ges. für Linde's Eismaschinen Akt.-Ges.—Fluxes for electric welding processes. 27th February, 1952. (734929.)

9037. Widd, T. V.—Electric heating means for a bed. 30th April, 1953. (734931.)

13752. Simplex Electric Co., Ltd.—Encased electric switchgear. 29th May, 1953. (734845.)

18505. Communications Patents, Ltd.—Electric signal distribution systems. 21st October, 1953. (734780.)

18514. Siemens-Reiniger-Werke Akt.-Ges.—Arrangement for the generation of brief supersonic impulses. 22nd July, 1952. (734939.)

18792. Thorn Electrical Industries, Ltd.—Luminescent materials. 20th July, 1953. (734940.)

21141. English Electric Co., Ltd.—Electrical circuits incorporating cold-cathode gas discharge tubes. 14th August, 1953. (735053.)

21588. General Electric Co., Ltd., and Mounsdon, M. H.—Fastening devices for lighting fittings. 27th August, 1953. (734854.)

23417. Campbell & Isherwood, Ltd., and Rawlinson, R.—Electric motor or generator brush arm securing and locating arrangement. 18th September, 1953. (734858.)

26160. Sylvania Electric Products, Inc.—Electric incandescent lamp. 17th October, 1952. (735064.)

1953

3281. Telefonaktiebolaget L. M. Ericsson.—Polarized a.c. bells. 5th February, 1953. (735075.)

4013. General Electric Co., Ltd., Bowtell, J. N., Jenkins, H. G., and Moore, J. A.—Electric incandescent filament lamps. 9th February, 1954. (734956.)

4680. General Electric Co., Ltd., and Beesley, J. H.—Electrical gas discharge tube counting or distributing circuits. 14th December, 1953. (734875.)

8526. Standard Telephones & Cables, Ltd.—Arrangement for magnetic concentration of an electron beam in a travelling-wave tube. 27th March, 1953. (734963.)

10316. Sidaway, J.—Combined solid fuel and electric fires. 15th April, 1954. (735079.)

11357. Standard Telephones & Cables, Ltd.—Method of attenuating the noise in radio sets. 24th April, 1953. (734971.)

12031. General Electric Co., Ltd., and Goodman, H. L.—Fractional fusion methods. 30th April, 1954. (734973.)

13232. Philips Electrical Industries, Ltd.—Low-pressure arc discharge tube circuit arrangements. 12th May, 1953. (734880.)

13664. Standard Telephones & Cables, Ltd.—Inductance coil adjusting arrangements. 15th May, 1953. (734890.)

13722. Thompson Electric Co.—Mounting for lighting fixtures. 15th May, 1953. (735080.)

18945. General Electric Co.—Saturable magnetic core control devices. 8th July, 1953. (734898.)

19043. Badische Anilin- & Soda-Fabrik Akt.-Ges.—Porous metal electrodes for accumulators. 9th July, 1953. (735084.)

20760. International Business Machines Corporation.—Gaseous electric discharge storage or counting tube. 27th July, 1953. (734903.)

21081. Carrier Corporation.—Refrigeration system provided with compressor unloading mechanism. 29th July, 1953. (734904.)

22844. Carlson, C. F.—Electrostatic recording of images of characters. 19th August, 1953. (734909.)

23161. Bristol Co.—Balanceable electric measuring networks. 21st August, 1953. (734999.)

23509. Automatic Telephone & Electric Co., Ltd.—Telephone systems. 26th May, 1954. (734911.)

24006. Whiting Corporation.—Electric arc furnaces. 31st August, 1953. (735089.)

24693. Bargehr, R.—Electric heating elements. 7th September, 1953. (735000.)

25733. British Thomson-Houston Co., Ltd.—Control of electrically operated winding or like mechanisms. 30th August, 1954. Addition to 666561. (735002.)

30988. Cleverdon, C. C.—Shock mounting for solenoids. 9th November, 1953. (734826.)

31401. Canadian General Electric Co., Ltd.—Windings for electrical apparatus. 12th November, 1953. (735011.)

The imme
facilities, r
laboratorie
are comple
of Power E
their thoro
vigorous re
and strict a
have becon
power prog
leading Po
Brush for t
installation
BRUSH BR